Final
PCB Removal Action Work Plan,
South Pacific Division Laboratory, 25 Liberty Ship Way, Sausalito, California

September 2005

Prepared for:

U.S. Army Corps of Engineers
South Pacific Division

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PCB Removal Action Work Plan,
South Pacific Division Laboratory, 25 Liberty Ship Way, Sausalito, California

September 2005

Recommendation

This decision document represents the selected removal action for the South Pacific Division Laboratory at 25 Liberty Ship Way, Sausalito, California. This document is developed in accordance with State of California environmental law and is not inconsistent with the National Contingency Plan. This decision is based on the administrative record for the site.

_____ _____

Philip T. Feir, Lieutenant Colonel, Date
U.S. Army Corps of Engineers
Commander, San Francisco District

_____ _____

Tony Landis, California Environmental Projection Agency Date
Department of Toxic Substances Control
Chief, Northern California Operations Office of Military Facilities

_____ _____

Curtis T. Scott, California Regional Water Quality Control Date
Board, San Francisco Bay Region
Chief, Groundwater Protection and Waste Containment Division

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List of Acronyms

ASG	Advanced Solutions Group
DTSC	Department of Toxic Substance Control
ESL	Environmental Screening Level
HASP	Health and Safety Plan
ITSI	Innovative Technical Solutions, Inc.
NCP	National Contingency Plan
PCBs	Polychlorinated Biphenyls
PCP	Pentachlorophenol
PCE	Perchloroethylene (Tetrachloroethene)
PRG	Preliminary Remedial Goal
RAWP	Removal Action Work Plan
SAP	Sampling and Analysis Plan
SPD	South Pacific Division
USACE	United States Army Corps of Engineer
USEPA	United States Environmental Protection Agency

Executive Summary

This Removal Action Work Plan describes the excavation and proper disposal of soil containing Polychlorinated Biphenyl (PCB) contamination from the former U.S. Army Corps of Engineers (USACE) South Pacific Division (SPD) Laboratory, a two-acre site in Sausalito, California. The property address is 25 Liberty Ship Way. The Department of Toxic Substances Control oversees the site and is assisted by the San Francisco Bay Regional Water Quality Control Board.

The SPD Laboratory site has a complex land use history. Beginning in the 19th century the area was used as a rail yard that was developed into a shipyard during World War II. The USACE acquired one building from the shipyard after the war and this was converted into the SPD Laboratory. A series of investigations has been conducted at the site beginning in 1998. These investigations have shown PCB and petroleum hydrocarbon contamination in the soil and groundwater. The contamination appears to be distributed in a sporadic fashion and is judged to be associated with historical activities that pre-date the SPD Laboratory operations. The current and future land use is commercial/industrial.

Based on the site characterization data and the soil removal goals, approximately 500-tons of soil will be excavated from the site and taken to an appropriate disposal facility. This removal action is focused on the PCB contamination. The excavation will be performed as described in this plan with the goal to remove as much of the PCB contaminated soil as possible given the limits of access and funding. A combination of both heavy equipment and hand excavation tools will likely be necessary at the site due to numerous underground utility lines. Post excavation samples will be collected. The goal of the removal action is to remove the largest mass of PCB contaminated soil and to generally reduce the contamination to levels below U.S. Environmental Protection Agency, Region 9 Preliminary Remedial Goals (PRGs) and California Region 2 Regional Water Quality Control Board Environmental Screening Levels for industrial land use. This may not always be possible due to the sporadic nature of the contamination, building stability, and underground utility protection considerations.

In addition, the project will include the analysis of a roof material sample for the presence of PCBs. Sediment in storm drain inlets and gutters along the north side of the SPD Laboratory will also be analyzed for PCBs, and the sediments will be removed if they contain contamination.

After this draft work plan is reviewed and approved by the regulatory agencies the public will be notified by an advertisement in a local newspaper. There will be a 30-day public comment period. Health and Safety procedures will be established to protect workers. The site will be restored to current conditions and a Removal Action Report prepared to document all activities.

1.0 INTRODUCTION

This Removal Action Work Plan details work to be performed at the South Pacific Division (SPD) Laboratory in Sausalito, California. The property address is 25 Liberty Ship Way.

1.1 Purpose

The purpose of this Removal Action Work Plan is to request and document for the Administrative Record the United States Army's decision to undertake a non-time critical removal action. This action is described herein for the SPD Laboratory. The non-time critical removal action at the SPD Laboratory pertains to the excavation and removal of PCB contaminated soils. This document is intended to substantively meet both Department of Toxic Substances Control (DTSC) requirements for preparation of a Removal Action Work Plan (RAWP) and San Francisco Regional Water Quality Control Board requirements for preparation of a Corrective Action Work Plan. The Army investigations of this site have followed the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Preliminary Assessment, Site Inspection, Remedial Investigation process.

1.2 Overview

The U.S. Army Corps of Engineers received the SPD Laboratory parcel in 1948 (the building was originally part of a shipyard). The soil is contaminated with Polychlorinated Biphenyl's (PCB's) as well as fuel products and fuel product constituents. The maximum detected concentration of PCBs and petroleum product in soil is 110 mg/kg and 470 mg/kg, respectively.

The U.S. Army Corps of Engineers plans to transfer the property to the U.S. Veterans Administration who will renovate the building for consolidated medical testing operations. A portion of the laboratory building may be set aside for City of Sausalito community activities. The land use will remain industrial/commercial.

The Department of Toxic Substances Control is the lead regulatory agency for the site, and the San Francisco Bay Regional Water Quality Control Board is providing support. In accordance with DTSC guidance, estimated costs for this project are less than $1 million and therefore a RAWP can be used in lieu of a Remedial Action Plan.

1.3 Activities to be Performed

This project involves the excavation and disposal of approximately 500-tons of soil with the highest PCB concentrations. The removal action is intended to remove as much as possible of the PCB contamination that exceeds the criteria described in Section 3. Notice of this removal action will be posted in a local newspaper and the public will be given 30 days for review and comment. Health and safety as well as spill prevention plans will be prepared and all workers made aware of their contents. Prior to any subsurface work the contractor will evaluate the

potential for building foundation damage and will locate all utilities. Paving will be removed during this work and will be replaced after excavations and backfilling is complete. The holding tank will not be removed during the excavation. All backfill will be properly compacted. The PCB contaminated soil will be properly transported to a facility permitted to receive such material. Both a roof material sample and sediments in the storm drain system along the north side of the SPD Laboratory will be analyzed for PCBs. Storm drain sediments found to be contaminated will be removed from system. A report will be prepared to document the removal action.

1.4 Future Land Use

The site lies within a commercial/industrial zone in the City of Sausalito. It is not anticipated that this land use will change. The Department of Toxic Substances Control requires land use restrictions for sites that do not achieve residential clean-up standards, as anticipated for the SPD Laboratory. If, as discussed above, the U.S. Army Corps of Engineers transfers this property to the U.S. Veterans Administration, this Removal Action Work Plan, the removal action report, and the environmental condition of property report will document the land use restrictions. Should the federal-to-federal transfer not occur, and title transfer take place, then appropriate deed restrictions will be prepared in addition to the land use restrictions discussed above.

2.0 SITE BACKGROUND

This section provides information about the site and the development history.

2.1 Site Description

The site is approximately 2 acres in size and lies along the Richardson Bay waterfront in Sausalito (Figure 1). The primary building on the site is a two-story structure that served as the laboratory. In addition, a small chemical storage building and a fenced equipment storage yard are present. The parcel is almost entirely paved and lies in the midst of an industrial/commercial area. No drinking water wells lie within one mile of the site.

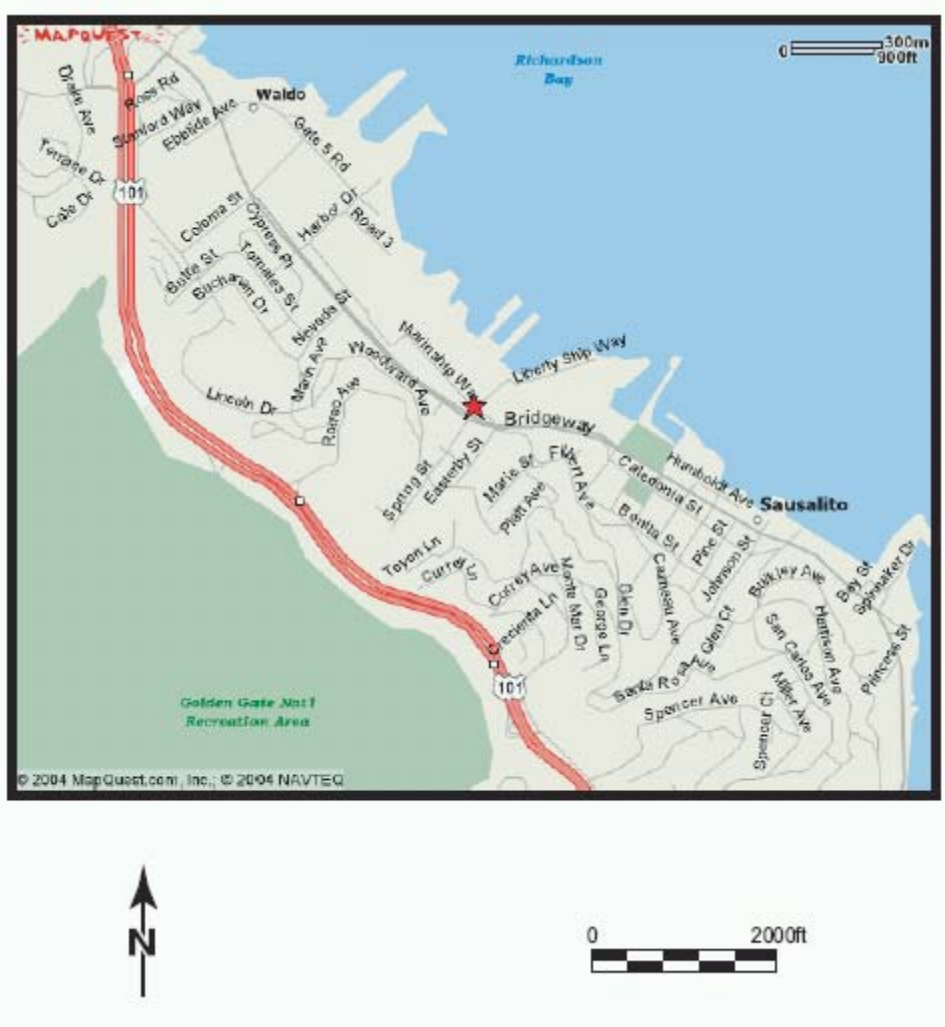

Figure 1. Location of the SPD Laboratory, Sausalito, California.

2.2 Site History

The area surrounding the site was first developed in the 1870's when the former Northwestern Pacific Railroad rail yard was constructed. Prior to this the area was a tidally influenced marsh. The rail yard was replaced in 1942 with the Marinship Corporation Shipyard. Many of the buildings currently in the area, including a machine shop destined to become the SPD Laboratory, were constructed at this time. In 1946 the Marinship shipyard was placed with the War Assets Administration, which in turn transferred the subject parcel to the U.S. Army Corps of Engineers in 1948. The former machine shop was converted to a geotechnical testing laboratory in 1950 and the analytical laboratory capability was added in the early 1990's. The SPD Laboratory closed in 1997.

2.3 Previous Investigations

This section summarizes the investigations conducted at this site by both the Army and U.S. Veterans Administration.

2.3.1 Preliminary Environmental Assessment

The Army conducted a Preliminary Environmental Assessment in 1998. This assessment involved records research and a site visit. The assessment identified the past industrial use (railroad yard and shipyard). No environmental samples were collected during the assessment (ITSI, 1998)

2.3.2 Preliminary Site Investigation

The Army conducted a Preliminary Site Investigation in 1999. The goal was to determine if contamination was present on site. Six soil borings were advanced and three test pits were excavated for soil and "grab" groundwater sample collection. Samples were analyzed for petroleum hydrocarbons, volatile organic compounds, polycyclic aromatic hydrocarbons, pesticides, PCBs, and metals. The report stated that PCBs, phenanthrene, lead and arsenic appeared to have been released to the soil, while tetrachloroethene (PCE) was identified in the groundwater. The testing determined that the PCBs consisted of Arochlor 1260. In addition, lead-based paint and asbestos were found in the main building (ITSI, 1999).

2.3.3 Remedial Investigation

The Army conducted a Remedial Investigation in 2001/2002. The goal was to further investigate arsenic in soils, to delineate the extent of PCE in groundwater, and to establish the lateral and vertical extent of PCBs in soil. A radiological survey was also performed. Ten soil borings were advanced and 13 test pits were excavated for soil and "grab" groundwater sample collection. The analytical methods used during the remedial investigation were similar to those used during the site investigation, with the exception of the addition of immunoassay PCB test kits. The test

pits and immunoassay PCB analysis were used to delineate the extent of the PCB contamination near the holding tank. This investigation confirmed the presence of petroleum hydrocarbons, polycyclic aromatic hydrocarbons and arsenic in the soil. Lead was not determined to be a site contaminant. Arsenic concentrations were judged to fall within the range of values expected for dredge fill (the site received dredge fill when the shipyard was constructed in the 1940's). Petroleum hydrocarbons (diesel range or higher), toluene, xylenes and pentachlorophenol (PCP) were found in the groundwater. The metals detected in the groundwater are not thought to represent contamination. With the exception of the area near the holding tank, the PCBs in soil were sporadically distributed and did not appear to represent a large mass. Petroleum hydrocarbon contamination was widely distributed across the site (at concentrations up to 470 mg/kg) but was not judged to represent a health threat or a significant risk to groundwater quality (ITSI, 2003).

2.3.4 Phase I Environmental Site Assessment

In 2004 the U.S. Veterans Administration conducted a Phase I Environmental Site Assessment in preparation for property transfer. The goals of the assessment were to identify the potential for unknown site contamination to exist at the site. The assessment included a records review and examination of existing reports. The conclusions of the assessment were similar to those in the Army's 1998 Preliminary Environmental Assessment. In addition to the railroad yard and shipyard the nearby Schoonmaker Building and drycleaners were identified as potentially creating conditions that could affect the site. No environmental samples were collected during this work (ASG, 2004a).

2.3.5 Subsurface Investigation of Soil and Groundwater Quality

As a follow-up to the Phase I Environmental Site Assessment, the U.S. Veterans Administration conducted a Subsurface Investigation of Soil and Groundwater Quality in 2004. The goal of the investigation was to confirm the results of previous activities and to investigate areas not previously characterized. Thirty borings were advanced and sixty soil samples were analyzed for PCB and petroleum hydrocarbons. In addition, six "grab" groundwater samples were collected for volatile organic compound analysis. The contaminants detected were consistent with those identified during earlier work, PCBs and petroleum hydrocarbons were found in the soil and benzene, toluene and naphthalene (fuel constituents) were found in the groundwater (ASG, 2004b).

2.3.6 Conceptual Site Model

The conceptual site model that has emerged combines what is known about the site history with the chemical data gathered beginning in 1998. The site was originally a tidally influenced marsh. Later the site was developed as a railroad yard, with the ground surface remaining close to the original elevation. The northeast part of the railroad yard near the bay was probably tidally influenced. The railroad yard operations lasted from the 1870's to 1942. In 1942 the ground surface of the site was raised with fill (and dredged sediment), as a part of the larger

construction of the shipyard. A machine shop was built that would later become the SPD Laboratory building. It was during the railroad and shipyard periods of operation that petroleum hydrocarbon products and PCBs were released to the site. They were apparently released in relatively small amounts and in a sporadic fashion. It is this historical contamination that the current investigations have identified. Table 2.1 is a summary of the maximum detected concentration of site contaminants. Tables 2.2 and 2.3 compare chemical detections, in soil and groundwater respectively, with regulatory criteria. Figure 2 shows the location of PCB concentrations in the vicinity of the proposed excavation.

Environmental restoration documents for nearby sites were reviewed for possible additional contaminant information related to the SPD Laboratory. Unfortunately these nearby sites did not provide additional information. Ambient metal concentration data were obtained from the San Francisco Environmental Institute web site which reported that the range of arsenic in Richardson Bay sediment is 5.4 to 12.8 mg/kg. The range of lead in Richardson Bay sediment is 13.3 to 45.6 mg/kg. In addition, the Army reviewed the Bradford, et al., study regarding California background soil concentrations: arsenic ranges from 0.59 to 11.0 mg/kg and lead ranges from 12.4 to 97.1 mg/kg.

Groundwater results indicate high dissolved solids, which is consistent with the tidally influenced historical marsh conditions. Specific conductance values ranged from 1000 to 11,000 µmho/cm (equivalent to 640 to 7,040 mg/L total dissolved solids, respectively). The contaminants detected in the water are consistent with the petroleum hydrocarbons found in the soil, as well as with industrial activities. Groundwater is encountered at a depth of about 6 to 12 feet below the ground surface and probably flows to the northeast (towards the bay).

The Marin County Municipal Water District provides drinking water and no drinking water wells are located within the City of Sausalito (Appendix F). Therefore receptors will not be exposed to site contaminants via the drinking water pathway. The contaminants at the site are not highly mobile in the subsurface. This lack of contaminant mobility, the fine-grained soil conditions, and the expected slow rate of groundwater movement also will minimize the likelihood of contaminant transport into Richardson Bay and consequently receptor exposure. The site is largely paved which will minimize exposure to contaminants in the soil. However, construction or utility maintenance activities involving soil excavation might exposure workers to contaminated soil. This is judged to be the only complete exposure pathway.

3.0 EXCAVATION RATIONALE

This section presents the goal of the removal action, applicable regulatory criteria, and the remedial alternatives considered.

3.1 Project Goal

The project goal is to remove PCB contaminated soil located between the former SPD Laboratory and the Bay Model building in order to reduce the mass of PCBs remaining at the site. An additional goal is to generally reduce the contamination to levels below the U.S. Environmental Protection Agency, Region 9 Preliminary Remedial Goals (PRGs) and California Regional Water Quality Control Board Environmental Screening Levels for industrial land use. This may not always be possible due to the sporadic nature of the contamination, building stability, and underground utility protection considerations. The excavation will be performed as described in this plan with the goal to remove as much of the PCB contaminated soil as possible given the limits of access and funding. The removal of the contaminated soil, when combined with the paving, will reduce the potential for exposure to both workers and visitors to the area. The excavated soil is to be disposed of at a permitted facility.

3.2 Applicable or Relevant and Appropriate Requirements and Criteria

This section identifies applicable or relevant and appropriate requirements (ARARs) for this Removal Action Work Plan. In addition the project specific criteria are presented.

3.2.1 Applicable or Relevant and Appropriate Requirements

In performing the selected remedy, the Army is required to comply with substantive requirements of ARARs pertaining to contaminant levels, or to operational, performance, or location-protective standards in accordance with CERCLA, as set forth in 40 CFR 300.415(J). ARARs may be specific to chemicals of potential concern (COPCs), location of the sites, or the actions being performed. Table 3.1 describes the chemical-specific ARARs, Table 3.2 describes the location-specific ARARs, and Table 3.3 describes the action-specific ARARs for the selected remedy. The specific cleanup levels presented in Section 3.2.2 are based on risk, rather than specific ARARs.

The National Oil and Hazardous Substances Pollution Contingency Plan, otherwise known as the "National Contingency Plan" or "NCP", defines "applicable" requirements as "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or

other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable" (40 CFR 300.5). The NCP further defines "relevant and appropriate" requirements as "those cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting criteria, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to a particular site" (40 CFR 300.5). In addition, advisories, criteria or guidance developed by the federal and state agencies may be pertinent to the selected remedy. These are identified as "To Be Considered" (TBC) documents. If a document identified as "TBC" is selected in a decision document, it has the same effect as an ARAR and will be complied with.

The San Francisco Bay Regional Water Quality Control Board Basin Plan (RWQCB, 2004) identifies beneficial uses for groundwater and surface water at the site and surrounding area. The groundwater beneficial use is identified as Municipal and Domestic Supply (MUN) throughout the region, however site total dissolved solid (TDS) data exceeds 3,000 mg/L. Therefore it is likely that the Regional Board would not assign a groundwater beneficial use of MUN at the SPD Laboratory. Surface water beneficial use in Richardson Bay includes the following:

- Ocean, Commercial, and Sport Fishing (COMM)
- Estuarine Habitat (EST)
- Industrial Service Supply (IND)
- Fish Migration (MIGR)
- Navigation (NAV)
- Preservation of Rare and Endangered Species (RARE)
- Water Contact Recreation (REC1)
- Non-contact Water Recreation (REC2)
- Shellfish Harvesting (SHELL)
- Fish Spawning (SPWN)
- Wildlife Habitat (WILD)

3.2.2 Criteria

The removal action will be performed to remove a localized area of PCB contaminated soil in order to reduce the mass of PCBs remaining at the site. Regulatory criteria that will be used to assess site conditions following the removal are as follows:

Land Use/Receptor	**Criteria (total PCBs)(mg/kg)**	**Source**
Industrial	0.74	1, 2
Construction/Trench Worker	8.4	3

1. US Environmental Protection Agency, Region IX Industrial Preliminary Remediation Goal (PRG) (USEPA, 2005).

2. California Regional Water Quality Control Board, Environmental Screening Levels, Table B, (CRWQCB, 2005).
3. California Regional Water Quality Control Board, Environmental Screening Levels, Table K-3, (CRWQCB, 2005).

In addition to the above criteria, factors that affect the potential for exposure (e.g. elimination or reduction of an exposure pathway) will also be used to assess site conditions following the removal.

3.3 Evaluation of Remedial Alternatives

This section presents the evaluation of the remedial alternatives considered for the site.

3.3.1 Evaluation Basis

Professional judgment was used to develop the limited array of alternatives that were considered in this evaluation. They were all judged to meet an initial consideration of effectiveness, implementability, and cost. The evaluation was performed in a qualitative manner and is grounded in the National Contingency Plan (NCP), which sets forth nine evaluation criteria to address the statutory requirements and the technical and policy considerations proven to be important for selection of a remedial alternative. They are:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility and volume
- Short-term effectiveness
- Implementability
- Cost
- State Acceptance
- Community Acceptance

3.3.2 Remedial Alternatives

The following general response actions were deemed appropriate for further analysis on this project; 1) no action, 2) institutional action, 3) containment and 4) removal. No action is included as required by the NCP. These general response actions are used to identify remedial

technologies that are assembled into alternatives. Remedial alternatives developed for the SPD Laboratory site include the following.

1. No Action
2. Institutional Controls (restricted access and land use controls)
3. Capping
4. Excavation and Paving

No Action. The no action alternative is retained throughout this evaluation as required by the NCP. This alternative provides a comparative baseline against which other alternatives can be evaluated. Under this alternative, no remedial action will be taken. In the no action alternative the materials are considered to be left "as is," without implementation of any institutional action or containment, removal, treatment, or other mitigating actions.

Institutional Controls. This alternative includes application of physical controls (such as fencing or other barriers) to limit access to areas with high PCB concentrations. This would be combined with land use controls such as covenants and deed restrictions to minimize contact with contaminated soils.

Capping. This is a containment general response action and consists of engineering controls to prevent contact with the contaminated soil. Migration of the contamination would also be minimized. A single-layered asphalt cap can control erosion and infiltration of runoff from precipitation. The cap prevents physical contact by humans or ecological receptors.

Excavation. In this alternative contaminated soil can be removed via excavation and transported to a proper disposal facility. All excavations will be backfilled with clean soil and compacted. It should be noted that while this alternative does not require the presence of a cap, the area is currently paved and the pavement removed for the excavation will be replaced. This alternative removes the most significant mass of PCB contamination from the site. All paving removed during the excavation will be replaced which will provide an additional barrier to contact with site contaminants.

3.3.3 Evaluation

No Action. Neither human nor ecological receptors are currently exposed to the PCB contaminated soil and therefore this alternative may meet short-term effectiveness criteria. However, human exposure is possible in the future during repair or replacement of underground utilities. Therefore the no action alternative would not be protective of human health and would not meet most of the other evaluation criteria with the exception of cost.

Institutional Controls. Application of physical barriers and institutional controls would meet the protection of human health criteria as long as the barriers remained in good repair. This alternative would also be compliant with short- and long-term effectiveness, implementability and cost criteria. The institutional controls alternative would not meet ARARs and reduction of toxicity, mobility and volume. While superior to the No Action alternative, it is unlikely that the

Institutional Control alternative would be acceptable to state regulatory agencies or the local community.

Capping. Installation of a new single-layered asphalt cap would provide an effective barrier to physical contact. This alternative is judged to meet all the evaluation criteria with the exception of long-term effectiveness and permanence, and reduction of toxicity, mobility and volume. It is also likely that this alternative would not be acceptable to state regulatory agencies and the local community.

Excavation. Removing the soil with the highest PCB concentrations will reduce the current and future risk of exposure to the contamination. In addition, this best meets the reduction of toxicity, mobility and volume criteria. Soil removal best meets the nine criteria with the exception of cost. However costs associated with this alternative are judged to fall within the range expected for a site of this size and complexity.

The Excavation alternative best meets the evaluation criteria and is selected for this site.

4.0 PROJECT ORGANIZATION AND SCHEDULING

Project team member and schedule requirements are included in this section.

4.1 Project Team Members

The project team members are as follows:

Agency	Name
Dept. of Toxic Substances Control	Charles Ridenour, Chief, Federal Facilities Unit
San Francisco Regional Board	Laurent Meillier, Remedial Project Manager
Corps of Engineers, Sacramento District	Paul Feldman, Project Manager
Corps of Engineers, Sacramento District	Brad Call, Senior Environmental Engineer
Corps of Engineers, Sacramento District	Cory Koger, Risk Assessor
Corps of Engineers, Sacramento District	Kathy Greene, Environmental Engineer
Corps of Engineers, Sacramento District	Donna Maxey, Industrial Hygienist

4.2 Project Schedule

The contractor shall provide the USACE project manager a detailed schedule at least 30 days prior to the removal action.

5.0 REMOVAL ACTIVITIES

5.1 Pre-excavation Activities

The following sections describe the activities that will be performed in preparation for the excavation work.

5.1.1 Permitting and Notification

Notification of the project will be performed in a local newspaper and there will be a 30-day public comment period. The contactor shall obtain all permits required for the removal action prior to the commencement of fieldwork.

The contractor shall notify the following individuals at least five (5) days prior to mobilization.

Paul Feldman Project Manager US Army Corps Sacramento District	1325 J Street Sacramento, CA 95814-2922 Phone: 916-557-7817 Fax: 916-557-7865
Charles Ridenour Chief, Federal Facilities Unit Department of Toxic Substances Control	8800 Cal Center Drive Sacramento, CA 95826-3200 Phone: 916-255-3571 Fax: 916-255-3734
Laurent Meillier Remedial Project Manager San Francisco Bay, Regional Water Board	1515 Clay Street, Suite 1400 Oakland, CA 94612 Phone: 510-622-2440 Fax: 510-622-2458

5.1.2 Mobilization and Preparatory Work

Personnel, equipment, materials, and temporary facilities necessary to execute the project will be mobilized as needed. Receipt and inspection of equipment and material will be documented on daily project logs. The contractor will have a quality control program to assure errors and deficiencies are minimal.

5.1.3 Site and Utility Clearance, Structural Stability Checks

No subsurface work will take place until all underground utilities and an underground holding tank (easternmost excavation area) have been located. The contractor must have a registered structural engineer provide guidance on how close the excavations can come to the building foundations. All engineering reports must be attached to the contractor's work plan.

5.1.4 Pre-excavation Survey

A licensed California land surveyor will survey the horizontal and vertical coordinates of the of the excavation site. The surveyor will use the appropriate surveying techniques and/or a global positioning system (GPS). The survey data will be presented in the Construction Completion Report.

5.1.5 Preparation of the Health and Safety Plan

The contractor shall prepare a Health and Safety Plan (HASP). This plan shall consider and incorporate the Health and Safety Design Analysis included as Appendix B to this Removal Action Work Plan. The HASP shall be submitted to the USACE project manager for review no later than 20 calendar days prior to the initiation of the field activities.

5.2 Excavation Activities

5.2.1 Excavation

Soil will be excavated per USACE-defined excavation boundaries (Figure 2) and placed into watertight roll-off units until disposed of. Final disposition of the soil will be based on laboratory sample analysis. The two 20-foot by 20-foot excavations will be dug to a depth of 4-feet below ground surface. The larger excavation (20-foot by 45-foot) shall be dug to a depth of 5-feet below the ground surface.

The contractor shall take all necessary measures to protect underground utilities during the excavation and will repair or replace any damaged utilities or the underground holding tank. Underground utilities and the underground holding tank should be supported in place when possible to allow for the removal of the underlying soil. Excavation work near these items may need to be performed by hand to avoid damage. The metal cyclone fence bisecting the site will be taken down and stored for replacement at the conclusion of the project. It may be necessary to move several concrete planters that lie along the Bay Model building.

During excavation activities, engineering controls such as water mist spray will be used for dust control as needed. Excavation will continue until the designed extent of the excavation is reached. The contractor shall have the responsibility to promptly repair any damage caused to structures or utilities. Personnel performing hand excavation activities will not enter the excavation without the approval of the Site Safety and Health Officer.

The total estimated area for the excavation is 1700 square feet. The total estimated excavation volume is 285 cubic yards.

5.2.2 Site Control

Site controls will be established to protect the public from construction hazards (i.e., heavy equipment and open excavations). Traffic control devices, such as temporary fencing, barricades, cones, delineators, and signage, will be employed as necessary to manage pedestrian and vehicular traffic.

5.2.3 Soil Sampling

Refer to the Sampling and Analysis Plan (SAP) (found at Appendix A) for the details on the post-excavation and waste soil characterization sampling.

5.2.4 Decontamination and Temporary Waste Storage

A decontamination area for equipment will be set up. A water source and water-collection tank will be located near the decontamination area. Equipment will be decontaminated prior to demobilizing from the site. Tires or treads of equipment that have traveled on contaminated soil will be cleaned.

Reusable sampling equipment that will come in direct contact with soil, including trowels and bowls, will be thoroughly decontaminated. Personnel decontamination areas will be established as required the Health and Safety Plan (HASP).

At the end of each workday, wastes from decontamination activities will be stored in a designated storage area until final disposal.

5.2.5 Post excavation survey

A licensed California land surveyor will survey the horizontal and vertical excavation coordinates. The surveyor will use the appropriate surveying techniques and/or a global positioning system (GPS). The survey data will be presented in the Construction Completion Report.

5.2.6 Backfilling

The excavation will be backfilled to match the existing grade using clean, imported, low permeability soils. A certification letter from the borrow source indicating that the soil is free of contamination will be included in the Construction Completion Report. The soil will be compacted to at least 95 percent relative compaction.

5.2.7 Signs

The Contractor shall create four painted metal signs that warn of contaminated soils in the area. These signs shall be approximately 24-inches by 24-inches and shall be affixed to the exterior of the building. The specific wording of the signs shall be coordinated with the Army and regulatory agencies.

5.2.8 Site Restoration

After field activities have been completed, the site shall be restored to conditions similar to (or better than) conditions before project activities began. The Contractor shall replace all paving removed or damaged during the removal action. The Contractor shall replace the metal cyclone fence that bisects the site, as well as any concrete planters moved during this project.

5.2.9 Demobilization

Demobilization of the work area will begin with any necessary decontamination of all equipment, tools and supplies. Following decontamination, all equipment, tools, supplies, containers, traffic control devices, signage, and debris shall be removed from the site.

A site walk through will be conducted with Army personnel to determine complete site restoration has been accomplished.

5.3 Additional Sampling and Sediment Removal

As requested by the regulatory agencies, additional sampling will be conducted as a part of this project. A single sample of bituminous roof material will be collected and this will be tested for the presence of PCBs using EPA Method 8082. Sediment samples will be collected (if possible) from the storm drain inlet boxes and/or gutter downspout system and tested for the presence of PCBs using EPA Method 8082. A maximum of four sediment samples will be collected. The sediment will be cleaned from within the storm drain system if found to be contaminated with PCBs from the SPD Laboratory.

6.0 DISPOSAL OF SOIL AND OTHER WASTE

6.1 Waste Categories

6.1.2 Soil

Soil will be transported to and disposed at an off-site facility permitted to receive the material. Soil will be sampled for waste disposal characterization at the frequency required by the disposal facility. The samples will be analyzed for the analytes and parameters and by the methods required by the disposal facility. Copies of analytical test results will be provided to the disposal facility as required to obtain disposal acceptance. Analytical data from waste profile samples will be reviewed prior to completion of waste profiling and removal of the stockpiled soil from the site.

Bulk carriers will transport the soil off-site to the licensed disposal facility. The carriers will be owned and operated by a transporter that is licensed and permitted to transport the waste soil. The waste soil will be transported under bill-of-lading or Uniform Hazardous Waste Manifest, if required.

6.1.2 Liquids

Liquid wastes generated during the soil removal activities may include decontamination rinsate water and water pumped from the excavation. These liquids will be collected and stored in drums or portable tanks and transferred directly to a vacuum truck or trailer for transport to a disposal facility, or discharged in accordance with regulatory requirements.

Samples will be collected, as required by the disposal facility, and the water will be characterized for disposal. Once acceptance has been received from the disposal facility and the generator, the water will be transported off-site for treatment/disposal under a non-hazardous waste transport form or manifest.

6.1.3 Asphalt

Asphalt debris must be disposed of in accordance with the receiving facility's requirements. The Contractor shall attempt to send the asphalt debris to a recycler to minimize land filling.

6.1.4 Debris and Miscellaneous Waste

Debris consisting of non-hazardous combustible and non-combustible wastes resulting from demolition and clearing and grubbing waste will be disposed of off-site according to applicable Federal, State, and local requirements.

Miscellaneous waste such as construction debris, polyethylene sheeting, and general trash, will be disposed of as non-hazardous waste at a generator-approved landfill or an off-site recycling facility.

6.2 Waste Characterization

All non-soil and non-trash related wastes will be characterized as part of the remediation activities. These non-soil/non-trash wastes generated during field activities will be stored on-site until applicable laboratory analytical results are available. These results will be used to designate the waste as California Hazardous, Federal Hazardous, or non-hazardous.

6.3 Labeling of Waste Containers

A label will be immediately attached to any container holding waste material. The container will be stored upright with the label placed on the side of the container in the upper third section (not on the top). The label will be filled out using waterproof ink. The contents of the container and the date upon which each period of accumulation begins will be clearly marked and visible for inspection on each container. "Accumulation" begins when waste is first added to the container, even if it is not filled.

6.4 Handling Drums and Containers

The handling of drums and containers will be kept to a minimum and site activities will be organized to minimize the amount of drum or container movement. Where drum movement is required, it will be done by mechanical means (forklift, truck lift gate, etc.) or by approved manual means (drum dolly, team lift, etc.).

6.5 Waste Manifesting Procedures

The contractor will obtain and complete all waste manifests as required for materials disposed off-site. If a return copy of the manifest is not received from the disposal site within 30 days, the contractor will contact the transporter and disposal facility to assess the status of the waste. If the manifest copy has still not been received in 45 days, a report will be filed with Cal-EPA,

Department of Toxic Substances Control (DTSC) as required by the California Hazardous Waste Control Law. The USACE Project Manager will be updated as necessary.

6.6 Transporters and Disposal Sites

The contaminated soil will be transported to a licensed facility to be identified by the Contractor.

7.0 POST CONSTRUCTION DOCUMENTATION

The contractor shall prepare a construction removal action report at the conclusion of the project. This report shall be submitted to the USACE project manager for review and distribution to the regulatory agencies. Survey data, excavated soil quantities, analytical test results, waste manifests and disposal records will be included in the report. In addition, procedures used, requests for information, problems encountered during the project and photographs documenting work activities will also be included in the report.

8.0 REFERENCES

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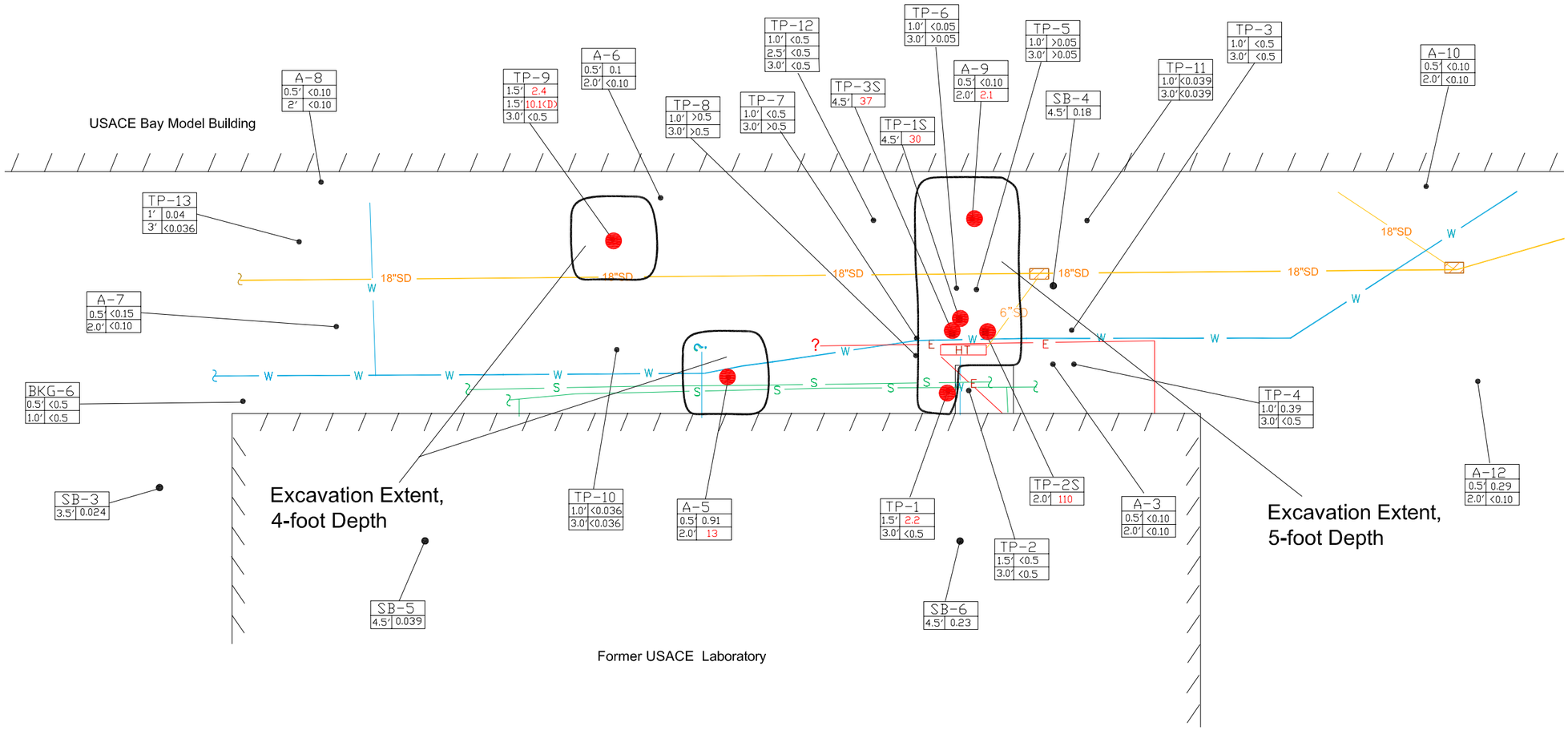
Figures



LEGEND

- Storm Drain Catch Basin
- E — Underground Electrical Line
- 18"SD — 18- inch Diameter Storm Drain
- W — 8- inch Diameter Water Line
- S — Sewer Line
- HT — Location of Subsurface Holding Tank

NOTES:

All Concentrations in Milligrams per Kilogram (mg/Kg)

Large Red Points- Concentration Exceeds 0.74 mg/kg

This figure shows all data collected by both the Army and Veteran's Administration

0 25 50

Approximate Scale (feet)

U. S. Army Corps of Engineers
Sacramento District

US Army Corps Of Engineers
South Pacific Division Laboratory
Sausalito, California

Figure 2
Proposed Excavation Area
Action Memorandum
August 2005

Tables

Table 2.1

Summary of Contaminants in Soil and Groundwater (maximum concentration)

Contaminant	Soil (mg/kg)	Groundwater (ug/l)
Diesel range	30	not detected
Motor oil range	470	730
PCB (Arochlor 1260)	110	not detected
Tetrachloroethene (PCE)	not detected	2.1
Toluene	not detected	2.5
Xylenes	not detected	2.2
Phenanthrene	0.28	not detected
Benzo(b,k)fluoranthene	1.1	not detected
Pyrene	0.93	not detected
Fluoranthene	0.99	not detected
Anthracene	0.086	not detected
Benzo(a)anthracene	0.17	not detected
Benzo(b)fluoranthene	0.19	not detected
Benzo(k)fluoranthene	0.062	not detected
Benzo(g,h,i)perylene	0.094	not detected
Benzo(a)pyrene	0.11	not detected
Chrysene	0.14	not detected
Dibenz(a,h)anthracene	0.13	not detected
Ideno(1,2,3-cd)pyrene	0.14	not detected
Pentachlorophenol	0.084 J	not detected
Arsenic	30	390
Lead	360	900

Note: “J” indicates an approximate value.

Table 2.2

Comparison of Maximum Detected Concentrations in Soil to Regulatory Criteria.

Contaminant	Soil (mg/kg)	Region 2 ESLs (mg/kg)	EPA Region 9 PRGs (mg/kg)
Diesel range	30	500	na
Motor oil range	470	1000	na
PCB (Arochlor 1260)	110	0.74	0.74
Phenanthrene	0.28	11	na
Benzo(b,k)fluoranthene	1.1	1.3	2.1
Pyrene	0.93	85	29,000
Fluoranthene	0.99	40	22,000
Anthracene	0.086	2.8	100,000
Benzo(a)anthracene	0.17	1.3	2.1
Benzo(b)fluoranthene	0.19	1.3	2.1
Benzo(k)fluoranthene	0.062	1.3	21
Benzo(g,h,i)perylene	0.094	27	na
Benzo(a)pyrene	0.11	0.13	0.21
Chrysene	0.14	13	210
Dibenz(a,h)anthracene	0.13	0.38	0.21
Ideno(1,2,3-cd)pyrene	0.14	1.3	2.1
Pentachlorophenol	0.084 J	5	9.0
Arsenic	30	5.5	1.6
Lead	360	750	800

Note:
1. "J" indicates an approximate value.
2. "Region 2 ESLs" obtained from *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Volume 1: Summary Tier 1 Lookup Tables, California Regional Water Quality Control Board, San Francisco Bay Region*, Interim Final, February 2005. Shallow Soils (≤ 3m bgs), not a current or potential source of drinking water, Table B, soil, commercial/industrial landuse.
3. "EPA Region 9 PRGs" obtained from US EPA Region 9, PRG Table, dated October 2004, industrial soil.
4. "na" indicates that a value is not available.

Table 2.3

Comparison of Maximum Detected Concentrations in Groundwater to Regulatory Criteria.

Contaminant	Groundwater (ug/l)	Region 2 ESLs (ug/l)
Motor oil range	730	640
Tetrachloroethene (PCE)	2.1	120
Toluene	2.5	130
Xylenes	2.2	100
Arsenic	390	36
Lead	900	2.5

Notes:
1. "Region 2 ESLs" obtained from *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Volume 1: Summary Tier 1 Lookup Tables, California Regional Water Quality Control Board, San Francisco Bay Region*, Interim Final, February 2005. Shallow Soils (≤ 3m bgs), not a current or potential source of drinking water, Table B, groundwater.

Table 3.1

SPD Laboratory PCB Removal Action Work Plan
Chemical-Specific ARARs and TBCs

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks	Associated Sites
Clean Water Act (CWA)	CWA §303 and 304 40 CFR 130.3 (Water Quality Standards) Specific water quality criteria are published in Quality Criteria for Water 1986 (EPA 44/5-86-001)	Relevant and Appropriate	Under the CWA, EPA has established ambient water quality criteria (AWQC) for the protection of saltwater aquatic life. EPA established AWQC to "protect essential and significant life in the water and also to protect life...that may consume...any edible portion of such life." (Appendix C of EPA 44/5-86/001). AWQC are non-enforceable guidance used by states to develop water quality standards (WQSs), also referred to as water quality objectives (WQOs). CERCLA §121 states that remedial actions shall attain Federal AWQC where they are relevant and appropriate	Based on four specific factors, AWQC are relevant and appropriate for the site. 1) Groundwater at the site may recharge the San Francisco Bay where salinities are greater than 5 parts per thousand (ppt), i.e., are saline or salt waters. Consequently, the beneficial uses of this groundwater include preservation of fish, wildlife, and other saltwater aquatic organisms. 2) The medium potentially affected by discharges of groundwater is saltwater, the medium addressed by AWQC. 3) The goal of AWQC is the protection of aquatic life. And 4) The AWQC are continuously updated as	All sites that discharge groundwater to surface water.

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks	Associated Sites
				information on the aquatic toxicity of chemicals is developed, thus they represent the latest information available.	
Toxic Substances Control Act (TSCA), 15 USC 2601 *et seq*.	40 CFR 761.60 (PCB Spill Cleanup Policy)	Relevant and Appropriate	The PCB Spill Cleanup Policy establishes specific, numerical cleanup goals for soils and surfaces based on: location, the potential for exposure, the concentration of PCBs initially spilled, and the nature and size of the populations potentially exposed. For non-restricted access sites (residential/commercial areas and unrestricted access rural areas) the standard for soil is 10 parts per million (ppm) PCB by weight provided that the soil is excavated to a minimum depth of 10 inches and a 10-inch cap of clean soil (containing less than 1 ppm PCBs) is put on the site as part of restoration activities. The policy also establishes	The PCB Spill Cleanup Policy applies to spills that occurred after May 4, 1987. Since the period when PCBs entered soil at the site is not dated, it is assumed that this policy is not applicable but is relevant and appropriate. The Army has agreed to the more stringent cleanup goal of 0.74 ppm PCBs for the site.	All sites where PCBs were managed or used.

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks	Associated Sites
			a category for spills at sites warranting additional cleanup. This section does not establish a numerical goal but the narrative goal indicates that EPA may establish stricter cleanup goals if site-specific risk factors warrant additional cleanup.		
Porter-Cologne Water Quality Control Act	SWRCB Resolution 88-63	Applicable	State Water Resources Control Board (SWRCB) Resolution 88-63 applies to all sites that may be affected by discharges of waste to groundwater or surface water. The resolution specifies that all surface water and groundwater have the beneficial use of municipal or domestic supply (MUN) except for surface or groundwater exceeding 3,000 mg/L total dissolved solids (TDS) and that is not reasonably expected to be a public water supply (i.e. that has a sustained yield of less than 200 gallons per day).	Site investigations reveal high salinity in the groundwater (i.e. TDS is greater than 3,000 mg/L). The groundwater in this area is currently designated in the SFBRWQCB Water Quality Control Plan as MUN, however the Regional Board is expected to acknowledge that water quality is not suitable for MUN at the site.	Sites with groundwater contamination.

Table 3.2

SPD Laboratory PCB Removal Action Work Plan
Location-Specific ARARs and TBCs

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks	Associated Sites
Clean Water Act (CWA) & River and Harbors Act	Section 404 et seq.; 33 CFR Part 320 (General regulatory) Part 323 (Permits for discharges) Part 330 (Nationwide Permit)	Applicable	These regulations require that any action conducted in or near a water of the United States eliminate or minimize impacts on surface waters. The actions covered under these provisions include the release of excavated materials into the waters of the U.S. which are incidental to any activity, including excavation.	Excavation at the site has the potential to discharge soils or sediments to San Francisco Bay, a navigable water of the United States. The substantive provisions of the Nationwide Permits would be applicable for any discharge that occurs.	Any site with the potential discharge soil or sediment to the Bay.

Table 3.3

SPD Laboratory PCB Removal Action Work Plan
Action-Specific ARARs and TBCs

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks	Associated Sites
Clean Water Act (CWA)	40 CFR 122.26	Relevant and Appropriate	Establishes permitting standards for discharge of pollutants from any point source into U.S. waters based on AWQC. The National Pollutant Discharge Elimination System (NPDES) requirements control storm water discharges. Additional requirements for permitting and planning are required for sites greater than 5 acres.	Not currently applicable because the excavation will be smaller than 5 acres. Relevant and appropriate to excavation activities. Best management practices will be implemented through a Storm Water Management Plan.	Sites where soil will be excavated.
Hazardous Material Transportation Act	40 CFR 107 and 171-177	Applicable	Establishes packaging, placarding, labeling, driver training and record keeping requirements for transport of hazardous materials along public roads.	Applicable to any hazardous waste or material shipped off-site for disposal.	All sites where excavated materials meet the definition of hazardous waste.
Porter-Cologne Water Quality	SWRCB Resolution 92-49 (as amended April 21, 1994 and October 2,	Relevant and Appropriate	Resolution 92-49 provides the SWRCB and RWQCB procedures for	To maintain the highest quality of water (Resolution 68-16),	All sites that may have soil levels of

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks	Associated Sites
Control Act	1996), Section III-G		investigation, cleanup, and abatement. Discharges are required to be cleaned up and abated in a manner that promotes attainment of background water quality or the highest reasonable water quality. Resolution 92-49 requires actions for cleanup and abatement to conform to Resolution 68-16 if there is a discharge; to water quality control plans and policies; and to applicable provisions of 23 CCR, Division 3, Chapter 15 as feasible. Section III-G directs the Water Boards to ensure cleanup and abatement of the "effects" of discharges in a manner promoting attainment of either background water quality or the best reasonable water quality if background levels are not feasible. (Feasibility is determined by factors listed in Section III-G, 23 CCR chapter 15,	SWRCB regulations govern discharges to land. Alternative cleanup levels greater than background shall be consistent with maximum benefit to the public and future beneficial uses, and will conform to water quality control plans and policies. It has not been resolved through precedent or court interpretations if Resolution 92-49 or Section 66264.94 are relevant and appropriate for vadose zone cleanups. Also, the Army does not believe a discharge has occurred that triggers application of the required actions under this Resolution.	chemicals that pose a threat to groundwater quality.

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks	Associated Sites
			Section 2550.4). Minimal water standards must be protective of beneficial uses.		
California Hazardous Waste Control Act (HWCA)	22 CCR 66268.40	Applicable	A waste identified in the table "Treatment Standards for Hazardous Waste" may be land disposed only if it meets the requirements for waste concentrations found in the table.	Hazardous wastes and soils removed from all sites must be characterized by the generator enough to determine whether they may be land disposed off-site without treatment. Wastes requiring treatment prior to disposal must be treated. This will occur at waste disposal facilities as needed.	All sites where excavated materials meet the definition of hazardous waste.
HWCA	22 CCR 66262.10(a) and 66262.11	Applicable	Generator of waste shall determine if the waste meets the definition of hazardous waste.	Applicable at all sites where excavation will generate hazardous waste.	All sites where excavated materials meet the definition of hazardous waste.
HWCA	22 CCR 66262.40	Applicable	Generator shall manifest waste shipments according to requirements and keep a signed copy of each hazardous waste shipment manifest and disposal facility receipt manifest for	Applicable to hazardous waste generated and shipped off-site.	All sites where hazardous waste is shipped off-site.

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks	Associated Sites
			three years.		
HWCA	22 CCR 66262.34	Applicable	Generator may accumulate hazardous waste on-site for <90 days or generator must comply with operating requirements for permitted TSD facility unless a variance is obtained from DTSC. California Assembly Bill 1706 provides for exemption from a permit for up to one year for performance of voluntary corrective actions as long as substantive requirements for on-site storage are met.	Applicable to any hazardous waste temporarily staged on-site after excavation and prior to transport.	All sites where hazardous waste is generated.

Appendix A

Sampling and Analysis Plan

APPENDIX A

SAMPLING AND ANALYSIS PLAN

South Pacific Division Laboratory
Sausalito, California
April 2005

1.0 Introduction

1.1 Site Description

The site is approximately 2 acres in size and lies along the Richardson Bay waterfront in Sausalito (Figure 1). The primary building on the site is a two-story structure that served as the laboratory. In addition a small chemical storage building and a fenced equipment storage yard are present. The parcel is almost entirely paved and lies in the midst of an industrial/commercial area.

1.2 Sampling Plan

Soil samples (post-excavation) will be taken within the excavation to establish the concentration remaining after the removal action is complete. There are three distinct areas for excavation. Two areas are approximately 20 feet by 20 feet by 4 feet deep, with a third area of approximately 20 feet by 45 feet by 5 feet deep. One discreet soil sample from each sidewall will be taken, along with two discreet samples from the bottom of each excavation. The sidewall samples will be taken at mid-depth of the excavation. The third area of excavation will have two samples taken from each of the long sidewalls, one sample from each of the short sidewalls, and three samples taken from the bottom of the excavation. A total of 21 post-excavation soil samples will be taken from all three of the excavations. A field portable analytical method (such as immunoassay or ion specific electrode) will be deployed if possible to monitor the progress of the excavation.

A sample of the building roof material will be collected for PCB analysis. Up to four sediment samples will be collected from the building down spouts and storm drain lines for PCB analysis.

In addition samples will be collected (waste profiling) from the stockpiled soil within the bins. This sampling will be performed to establish concentrations as stipulated by the receiving facility. The details of this sampling will be established once the receiving facility is identified and their requirements are known. The discussion that follows is focused on the post-excavation sampling and associated QC requirements.

1.3 Analysis Plan

The COPCs for this site are PCBs [Aroclors (total)]. Post excavation samples will be analyzed using EPA Method 8082A.

2.0 Quality Control Samples

The following QC samples will be collected to assess precision and accuracy. All data that will be collected for this investigation site will be definitive data. Definitive data measures organics/inorganics using EPA procedures and should produce data that can be used in risk assessment, site characterization, alternative evaluation, engineering design, and monitoring. The data obtained will conform to the quality control requirements specified in the QAPP.

The QC evaluation of the laboratory data will determine whether the data meet the requirements of the QAPP and will include an evaluation of the laboratory data, performed per the analytical methods. These measurements include precision, accuracy, representativeness, completeness, and comparability (PARCC).

2.1 Field Duplicates

QC duplicate samples collected in the field provide precision information for the entire measurement system including sample acquisition, homogeneity, handling, shipping, storage, preparation, and analysis. The identity of these samples is held blind to the analysts and laboratory personnel until the data are in deliverable form. Duplicate analyses will be performed on approximately 10% of the total investigative samples for each matrix. Duplicate samples will be analyzed by the laboratory for the same parameters as the primary samples.

2.2 Matrix Spike/Matrix Spike Duplicate

A Matrix Spike (MS) is an environmental sample to which known concentrations of analytes have been added. The MS is taken through the entire analytical procedure and the recovery of the analytes is calculated. Results are expressed as percent recovery. The MS is used to evaluate the effect of the sample matrix on the accuracy of the analysis.

A Matrix Spike Duplicate (MSD) is an environmental sample that is divided into two separate aliquots, each of which is spiked with known concentrations of analytes. The two spiked aliquots are processed separately and the results compared to determine the effects of the matrix on the precision and accuracy of the analysis. Results are expressed as relative percent difference (RPD) and percent recovery (%R).

Additional sample volumes will be collected in the field to perform MS/MSD analyses. MS/MSD samples will be performed at a rate of 20% of the total number of investigative samples for each matrix.

2.3 Blanks

2.3.1 Trip Blanks

Trip blanks are prepared in the laboratory, shipped with the sample containers to the site, and are kept with the investigative samples throughout the sampling event. They are then packaged for shipment with the other samples and submitted for analysis. A trip blank will be included with each shipment of soil samples requiring PCB analysis. Trip blanks will be analyzed for the same methods as the primary samples.

3.0 Sampling Equipment and Sampling Procedures

3.1 General Information

All fieldwork will be performed in accordance with the QAPP, Section 4.0, and the Site Specific Health and Safety Plan (SSHP). Records of the fieldwork, including samples collected, will be kept in a bound notebook unique to this study.

All samples will be located relative to the excavation footprint using a tape measure. The sample locations will be shown on the figures presented in the construction completion report.

3.2 Sampling Equipment and Procedures

All samples will be taken by hand with a split-spoon sampler using a 6-inch sleeve.

3.3 Soil Sampling

After collection, all samples (capped metal sleeve) will be labeled, placed in zippered bags and placed in an ice filled cooler for shipment to the laboratory. The samples will be sent to the laboratory via Federal Express under chain-of-custody protocol.

4.0 Sample Containers and Preservation

The laboratory performing the analyses will supply all sample containers for chemical analysis for this project. A complete set of sampling containers will be prepared for each sample in advance of the sampling event. Containers will be labeled with the date, sample number, project name, sampler's initials, and parameters for analysis and preserved as required. Trip blanks will be used for all coolers.

5.0 Sample Documentation and Handling

5.1 Sample Numbering System

A unique identification number will be assigned to each sample. This number is typically an alphanumeric or integer sequence that serves as an acronym to identify the sample. Specific sample identification procedures will follow a strategy as outlined below. Each sample will be numbered and include the following information:

- Location name (SPD-LAB)
- Soil sample (excavation + sample ID; e.g., EX1-001)

5.2 Sample Labels

All information pertaining to a particular sample is referenced by its identification number and is recorded on the sample container, in the field logbook, and on the sample chain-of- custody form. Following sample collection, the sample label is completed in waterproof ink and secured to the sample container with clear tape, which is wider than the label itself.

Each sample collected at each site will be labeled with the following information:

- Sample identification number;
- Sample location;
- Date and time of collections;
- Initials and signature of person collecting the sample;
- Analysis requested;
- Preservation; and
- Any other information pertinent to the sample.

5.3 Field Logbook

A field notebook bound with serially numbered pages will be used to record sample identification numbers, chain-of-custody numbers, and any significant observations or events. The project name, project number, site location, sampling event, and project manager will also be recorded. The field notebook will be maintained by the on-site field team leader, who will sign and date the notebook prior to initiation of fieldwork. If it is necessary to transfer the logbook to alternative personnel during the course of field work, the person relinquishing the logbook will sign and date the logbook at the time the logbook is transferred and the person receiving the logbook will do likewise. Corrections to erroneous data will be made by crossing a line through the entry and entering the correct information. The correction will be initialed and dated by the person making the entry. Unused portions of logbook pages will be crossed out, signed, and dated at the end of each workday. Logbook entries must be dated, legible, in ink, and contain accurate documentation. Language used will be objective, factual, and free of personal opinions.

The specific sampling location of each sample is recorded with each sample identification number in the field logbook and on the sample chain-of-custody form. The type of sample media is recorded with the sample identification number in the field logbook and on the chain-of-custody form. Laboratory analyses to be conducted on the sample are recorded with the sample identification number in the field logbook and on the chain-of-custody form.

The date and time of sampling preparation and collection, and personnel who conducted sampling are recorded with the sample identification number in the field logbook and on the chain-of-custody form. The names of visitors and any other persons on site are also recorded in the field logbook. Sampling personnel will also record the ambient weather conditions and other conditions at the sampling location that may affect sample collection, the apparent representativeness of the sample, or sample analysis in the field log book.

5.6 Photographs

Photographs will be taken of each portion of the site before, during, and after sampling activities to document site conditions. Photographs will be presented in the construction completion report.

5.7 Sample Packaging and Shipping

Samples will be transported as soon as possible after sample collection to the off-site laboratory for analysis. The following procedures are to be used when packing and transporting samples to the laboratory:

- Use waterproof metal or equivalent strength plastic ice chests, coolers, or protective containers;
- Place absorbent material in the bottom of the cooler;
- Package samples in individual plastic bags and place in cooler;
- Package wet ice in plastic bags and place bags around, among, and on top of the samples if required for sample preservation;
- Put paperwork (chain-of-custody record, etc.) in a waterproof plastic bag and tape it to the inside lid of the cooler;
- Tape the cooler lid and drain shut with fiber-reinforced tape;
- Place two numbered and signed custody seals on cooler, one at the front right and one at the back left of cooler;
- Put “This Side Up” and “Fragile” labels on all sides of any cooler containing glass bottles;

- Attach completed shipping label to the top of cooler and ship following the carrier's instructions.

Sample coolers will be shipped via Federal Express for overnight delivery to the laboratory. A copy of the bill of lading (air bill) is to be retained and becomes part of the sample custody documentation. The laboratory should be notified in advance of all shipments preferably by telephone on the day of shipment and by advanced scheduling.

5.8 Chain-of-Custody Procedures

All samples will be accompanied to the laboratory by a chain-of-custody form (COC) similar to that used by the USACE, i.e., CESPK Form 111. A copy of this form is shown on the next page.

The COCs will be filled out with ink. When the samples are transferred from one party to another, the individuals will sign, date, and note the time on the form. A separate form will accompany each delivery of samples to the laboratory. The COC will be included in the cooler used for preservation and transport of the samples. The sampling personnel will retain a copy of the form.

5.9 Investigation Derived Waste

It is anticipated that investigation derived waste (IDW) consisting of personal protective equipment (PPE), and empty containers will be generated during the course of the field work. PPE wastes, such as used nitrile gloves, paper towels, and zippered bags, will be disposed of as stipulated in the removal action work plan.

001000

CHAIN OF CUSTODY RECORD

Page ____ of ____

US ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
Environmental Engineering Branch
SPK-ED-E
1325 J Street
Sacramento, California
95814-2922

Project Name:	Laboratory:
Project Location:	Address:
Project Coordinator:	
Phone: FAX:	Contact:
Sampler: Phone:	Phone:

ANALYSIS REQUESTED →

SAMPLE IDENTIFICATION Field	SAMPLE IDENTIFICATION Laboratory	GRAB	COMP	DATE	TIME									MS/MSD	TURN AROUND TIME (DAYS)	MATRIX CODE	NUMBER OF PLASTIC	NUMBER OF GLASS	NUMBER OF VOA	NUMBER OF SLEEVE	NUMBER OF ENCORE	PRESERVATIVE CODE

COMMENTS/SPECIAL INSTRUCTIONS:

CHECKED BY:

PRESERVATIVE CODES:
C = HCl N = HNO_3 S = H_2SO_4

SAMPLE DISPOSAL:
☐ Hold ☐ Dispose ☐ Return

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME

MATRIX CODES:
W = Water Sl = Sludge SP = Solid Product
S = Soil A = Air LP = Liquid Product
Sd = Sediment

SHIPPING:
☐ Fed Ex ☐ Courier ☐ Hand Deliver
Airbill Number:

CESPK FORM 111
13 Feb 02

DISTRIBUTION: WHITE and YELLOW - send to testing laboratory; PINK - retained by originator

6.0 Sample Documentation and Handling

This QAPP presents functions, procedures, and specific QA and QC activities to ensure that all analytical data are consistently produced and of known quality that will meet project objectives. The QAPP provides data specifications for all anticipated analyses and establishes procedures for data review and assessment.

The QAPP format was derived following EPA QA/G-5, *Guidance for the Preparation of Quality Assurance Project Plans* (EPA, 2002b) and the QAPP elements were developed following EPA QA/R-5, *Requirements for Quality Assurance Project Plans* (EPA, 2001).

The purpose of this QAPP is to ensure that the data collected are of known and documented quality and useful for the purposes for which they are intended. The procedures described are designed to obtain data quality indicators for each field procedure and analytical method. Data quality indicators include the PARCC parameters. To ensure that quality data continues to be produced, systematic checks must show that test results and field procedures remain reproducible and that the analytical methodology is actually measuring the quantity of analytes in each sample.

The reliability and credibility of analytical laboratory results can be corroborated by the inclusion of a program of scheduled replicate analyses, analyses of standard or spiked samples. Regularly scheduled analyses of known duplicates, standards, and spiked samples are a routine aspect of data reduction, validation, and reporting procedures.

6.1 Analytical Methods Requirements

Table 6-1 provides a summary of the required analytical methods, sampling containers, preservation requirements, and associated analytical holding times required for this project.

Table 6-1: Summary of Analysis Methods Requirements						
Site Name	Number of Samples	Matrix	Number and Type of Container(1) and Preservation	Analytes	EPA Method	Holding Time
Excavation 1	6	Soil	4º ± 2º C, 6-inch capped sleeve	PCBs	SW 8082A	7 days to analysis
Excavation 2	6	Soil	4º ± 2º C, 6-inch capped sleeve	PCBs	SW 8082A	7 days to analysis
Excavation 3	9	Soil	4º ± 2º C, 6-inch capped sleeve	PCBs	SW 8082A	7 days to analysis

6.2 Sample Preparation Methods

The following section briefly summarizes the sample extraction and cleanup methods that will be performed for the determination of organic analytes. Cleanup methods must be used where applicable to meet the MQLs.

Method SW8082A: Polychlorinated Biphenyls by Gas Chromatography

Method SW8082 will be used to determine the concentration of various polychlorinated biphenyls (PCBs) as total Aroclors. Prior to analysis, the sample is extracted into solvent solution. An aliquot of the extracted sample solution is injected into an open-tubular capillary column, and detected by an electron capture detector (ECD).

7.0 Analytical Data Reduction and Review

All sample analyses will be performed at an off-site laboratory. The selected laboratories will be responsible for providing complete documentation of all analytical test results and QC sample results in a comprehensive certificate of analysis.

8.0 Quality Assurance And Quality Control Procedures

Different types of replicate and blank samples are collected as part of the QA/QC program. Several QC samples will be analyzed for this project to provide a means to assess both field and analytical performance. The following sections describe the different types of QC samples and how they are assessed to evaluate data quality.

8.1 Field QA/QC Checks

Field QC samples are consist of field duplicates and trip blanks. Each type of field QC sample undergoes the same preservation, analysis, and reporting procedures as the related environmental samples. The following table summarizes the field QC sample collection frequencies and acceptance limits.

Table 6-2: Field QC Sample Collection Frequencies and Acceptance Limits

QC Sample Type	Minimum Collection Frequency	Acceptance Limits
Field Duplicate	1 per 20 post-excavation samples / method	Relative Percent Difference (RPD) ≤ 50 RPD
Trip Blank	1 per cooler containing soil samples	All analytes < ½ MQL

8.2 Analytical QA/QC Checks

The laboratory will have a QA/QC program that monitors data quality with internal QC checks. Those specific internal QC checks and frequency of checks are provided in Appendix A and in the method-specific laboratory QA/QC procedures. These laboratory QC checks include blank samples, laboratory control samples (LCSs), duplicate analyses, and MS/MSDs.

9.0 Data Quality Indicators (PARCC Parameters)

The PARCC parameters are qualitative and quantitative statements regarding the quality characteristics of the data used to support project objectives and ultimately, environmental decisions. These parameters are presented in the remainder of this section.

9.1 Precision

Precision is a measure of the degree to which two or more measurements are in agreement, and describes the reproducibility of measurements of the same parameter for samples analyzed under similar conditions. A fundamental tenet of using precision measurements for QC is that precision will be bounded by known limits. Results outside these predetermined limits trigger corrective actions or indicate heterogeneity of contaminants within the environmental matrix. Precision will be evaluated from field duplicate data, laboratory duplicate data, and MS/MSD data. Acceptable precision is achieved when RPD values are within the acceptance criterion.

9.1.1 Field Precision

Field precision objectives are met by collecting and measuring field duplicates at a rate of 1 duplicate per 20 soil samples. The acceptance limit for field duplicate precision is $\leq$ 50 RPD for soil water results. This precision estimate encompasses the

combined uncertainty associated with sample collection, homogenization, splitting, handling, laboratory and field storage (if applicable), sub-sampling and preparation for analysis, and analysis.

9.1.2 Laboratory Precision Objectives

Laboratory precision QC samples (i.e., MS/MSD) will be analyzed with a minimum frequency of five percent. Acceptance limits for laboratory precision is ≤ 20 RPD for soil samples.

9.1.3 Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference value. This parameter is assessed by measuring spiked samples or well-characterized samples of certified analyte concentrations (e.g., LCS). Accuracy measurements are designed to detect biases resulting from the sample handling and analysis processes.

9.1.3.1 Field Accuracy Objectives

Field accuracy is maintained by monitoring adherence to procedures that prevent sample contamination or degradation. Accuracy also shall be improved qualitatively through adherence to all sample handling, preservation, and holding-time requirements.

9.1.3.2 Analytical Accuracy Objectives

Analytical accuracy is measured through the comparison of a spiked sample or LCS result to a known or calculated value and is expressed as a percent recovery (%R). MS/MSD analyses measure the combined accuracy effects of the sample matrix, sample preparation, and sample measurement. LCSs are used to assess the accuracy of laboratory operations. Each sample is spiked with target analytes for the analysis being

performed to ensure that accuracy measures are obtained for each target analyte. Spiking concentrations shall equal or approximate the mid-level calibration standard. Laboratory accuracy is assessed via comparison of calculated percent recovery values to accuracy control limits.

9.1.4 Representativeness

Representativeness is an expression of the degree to which the data accurately and precisely represents a characteristic of a population or environmental condition existing at the site. Adherence to this work plan and use of standardized sampling, handling, preparation, analysis, and reporting procedures ensure that the final data accurately represent the desired populations. Representativeness will be evaluated during data assessment to evaluate whether each datum belongs to the observed data distribution through outlier testing. Any anomalies will be investigated to assess their impact on statistical computations as part of the report.

9.1.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected under normal conditions. Completeness is expressed as a percentage. Technical completeness is a measure of the amount of usable, valid laboratory measurements per matrix obtained for each target analyte. Usable, valid results are those that are judged, after data assessment, to represent the sampling populations and to have not been rejected for use through data validation or data assessment. Analytical completeness objectives are 90 percent for each critical target analyte. Qualifications on the use of data caused by incomplete data sets will be documented in the report.

9.1.6 Comparability

Comparability is defined as the confidence with which one data set can be compared to another (e.g., between sampling points; between sampling events). Comparability is achieved by using standardized sampling and analysis methods and data reporting formats (including use of consistent units of measurement), and by ensuring that reporting and detection limits are sufficiently low to satisfy project detection and quantitation criteria for the duration of the project.

10.0 Preliminary Data Deliverables and Final Data Packages

All data shall be reported at the method detection limit (MDL) value where detects between the MDL and MQL are qualified as estimated values.

At the conclusion of all analytical work for this project, the laboratory will report all analytical data in the form of comprehensive certificates of analysis and electronic data deliverables consistent with the USACE Sacramento District Automated Data Review software. The final deliverables will be submitted no later than 21 days after collection of the last field sample.

11.0 Data Validation Reports

The project team will review all the data generated for the project. Laboratory data will be reviewed electronically using the Automated Data Review software, and verified by the project chemist. Data qualifiers will be assigned for the following QC outliers: contaminated blanks, LCS outliers, and MS/MSD outliers. Additionally, approximately 10 percent of the data will be validated at the raw data level to verify analyte detection and quantitation. Any effect on data quality determined during the raw data validation will initiate further review to determine the extent of the data quality issues on the dataset.

Table A-1: Summary of Calibration and Internal Quality Control Procedures for Method 8082 (PCBs)			
Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Five-point initial calibration	Prior to sample analysis when continuing calibration verification (CCV) fails	Option 1: relative standard deviation (RSD) for each analyte ≤ 20% Option 2: Linear regression: $r \geq 0.995$ Option 3: Non-linear regression coefficient of determination (COD) $r^2 \geq 0.990$ (6 points for 2nd order, 7 points for 3rd order)	Correct problem then repeat initial calibration.
Second source standard (not required if calibration verification below is prepared with a second source of the standard)	Following initial calibration	% Difference from expected value ≤ 15% for all analytes.	Correct problem, rerun second source standard. If that fails, repeat initial calibration.

Table A-1: Summary of Calibration and Internal Quality Control Procedures for Method 8082 (PCBs)			
Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Calibration verification	(ICV): At the beginning of an analysis sequence CCV: After every 10 field samples and at the end of the analysis sequence	Response factor (RF) for all analytes within ±15% of initial calibration response factor	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration CCV: Correct problem, then repeat CCV and reanalyze all samples since last successful CCV or ICV
Method Blank (MB)	1 per batch	All analytes < ½ quantitation limit (MQL)	Investigate possible contamination source. Take appropriate corrective action. Re-prepare and reanalyze all samples processed with a contaminated blank, unless analyte is not detected in associated samples or present at greater than 10x blank concentration.

Table A-1: Summary of Calibration and Internal Quality Control Procedures for Method 8082 (PCBs)			
Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Laboratory Control Sample (LCS)	1 per batch	Recovery limits: 70-130%	Correct problem, then reprepare and reanalyze LCS and all samples in the associated preparation batch for failed analytes.
Matrix Spike and Matrix Spike Duplicate (MS/MSD)	1 MS/MSD per 20 project samples when identified on the Chain-of-Custody	Recovery limits: 70-130% and Relative percent difference (RPD) <20 % for water samples	Evaluate for supportable matrix effect. If no interference is evident re-prepare and reanalyze MS/MSD and all samples in the batch once within the holding time. If still out report both sets of data.
Surrogate spike	All field and quality control samples	Recovery limits: 70-130%	Evaluate for supportable matrix effect. If no interference is evident re-prepare and reanalyze affected sample(s).
Method Quantitation Limit standard (lowest concentration on initial calibration curve)	Verify at least once for every matrix and field effort	MQLs established shall not exceed those in Table A-1.	MQLs that exceed established criteria shall be submitted to USACE Project Chemist for approval prior to analysis of any project samples.

Table A-1: Summary of Calibration and Internal Quality Control Procedures for Method 8082 (PCBs)			
Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Field Duplicate	At least 10% of samples	RPD ≤ 25% for paired results greater than the MQL	None – laboratory will not be able to identify field duplicate pairs and cannot make an assessment regarding acceptability. USACE project chemist to evaluate results for source of variability; notify data users of usability.

Table A-2: Data Evaluation/Qualification for Organic Methods				
Review Item	Method	Review Criteria	Action	Samples Qualified
Sample Collection, Preservation and Chain of Custody	All Organic Parameters	If the Chain of Custody is broken:	Qualify all results as unusable (R).	Samples in cooler.
		If the cooler temperature upon receipt is greater than 6°C or bubbles are found in VOA vials:	Qualify all volatile non-detects (U) as unusable (R). Qualify all other non-detects (U) as estimated (UJ). Qualify all detects as estimated (J).	Sample
		If samples were not chemical preserved properly:	Qualify all non-detects (U) as unusable (R). Qualify all detects as estimated (J).	Sample
Holding time (HT)	All Organic Parameters	If holding times are exceeded by less than 1.5 times the accepted holding time:	Qualify all non-detects (U) as estimated (UJ). Qualify all detects as estimated (J).	Sample

Table A-2: Data Evaluation/Qualification for Organic Methods				
Review Item	Method	Review Criteria	Action	Samples Qualified
		If holding times are exceeded by more than 1.5 times the accepted holding time:	Qualify all non-detects (U) as unusable (R). Qualify all detects as estimated (J).	Sample
Laboratory Method Blank	All Organic Parameters	If target analytes are detected above the MDL in the laboratory method blank, and the sample concentration (before dilution factor correction) is less than 5X that detected in the associated laboratory method blank (10X for common laboratory contaminants as defined by EPA National Functional Guidelines).	Qualify result as non-detected at an estimated detection limit (UJ) Increase MDL to the sample concentration Increase (but never decrease) the MQL to 5X the blank concentration (10X for common laboratory contaminants as defined by EPA National Functional Guidelines).	All samples in preparation batch

Table A-2: Data Evaluation/Qualification for Organic Methods				
Review Item	Method	Review Criteria	Action	Samples Qualified
		If target analytes are detected above the MDL in the laboratory method blank, and the sample concentration (before dilution factor correction) is greater than 5X that detected in the associated laboratory method blank (10X for common laboratory contaminants as defined by EPA National Functional Guidelines).	No Action Required	None
Surrogates	Semivolatile (GC/MS) (evaluate acid and base/neutral fractions	If two or more surrogates (base neutral or acid fraction) have a recovery greater than the UCL specify the fraction being qualified (i.e., acid, base/neutral or both)	Qualify detected compounds as estimated (J). Non-detected compounds should not be qualified.	Specified fraction(s) of sample

Table A-2: Data Evaluation/Qualification for Organic Methods				
Review Item	Method	Review Criteria	Action	Samples Qualified
	l fractions separately)	If two or more surrogates in either fraction (base neutral or acid fraction) have a recovery greater than 10% but less than the Lower Control Level (LCL) specify the fraction being qualified (i.e., acid, base/neutral or both)	Qualify detected compounds as estimated (J). Qualify non-detected compounds as undetected with a estimated limit of detection (UJ)	Specified fraction(s) of sample
		If any surrogate has less than 10 percent recovery specify the fraction being qualified (i.e., acid, base/neutral or both)	Qualify detected compounds as estimated (J). Qualify non-detected compounds as unusable (R).	Specified fraction(s) of sample
Surrogates	Volatiles (GC/MS) & all GC methods	If any surrogate has a recovery greater than the Upper Control Limit (UCL):	Qualify detected compounds as estimated (J). Non-detected compounds should not be qualified.	Sample

Table A-2: Data Evaluation/Qualification for Organic Methods				
Review Item	Method	Review Criteria	Action	Samples Qualified
	methods (evaluate primary and confirmatory analyses separately)	If any surrogate has a recovery greater than 10 percent but less than the LCL:	Qualify detected compounds as estimated (J). Qualify non-detected compounds as undetected with a estimated limit of detection (UJ)	Sample
		If any surrogate has less than 10 percent recovery:	Qualify detected compounds as estimated (J). Qualify non-detected compounds as unusable (R).	Sample
LCS/LCSD	All Organic Parameters	Analyte % Recovery > UCL: (For either the LCS or LCSD)	Qualify all detects for that analyte as estimated (J). Non-detected compounds should not be qualified.	All samples in preparation batch

Table A-2: Data Evaluation/Qualification for Organic Methods				
Review Item	Method	Review Criteria	Action	Samples Qualified
		Analyte % Recovery >10% but < LCL: (For either the LCS or LCSD)	Qualify all detects for that analyte as estimated (J). Non-detected compounds should be qualified as undetected with a estimated limit of detection (UJ)	All samples in preparation batch
		Analyte % Recovery <10%:	Qualify all detects for that analyte as estimated (J). Qualify non-detected compounds as unusable (R).	All samples in preparation batch
		Analyte RPD is greater than the UCL:	Qualify all detects for that analyte as estimated (J).	All samples in preparation batch

Table A-2: Data Evaluation/Qualification for Organic Methods				
Review Item	Method	Review Criteria	Action	Samples Qualified
Matrix Spike Recovery	All Organic Parameters	Analyte % Recovery > UCL[1]:	Qualify all detects for that analyte as estimated (J). Non-detected compounds should not be qualified.	Parent sample (including field dup)
		Analyte % Recovery >10% but < LCL[1]:	Qualify all detects for that analyte as estimated (J). Non-detected compounds should be qualified as undetected with a estimated limit of detection (UJ)	Parent sample (including field dup)
		Analyte % Recovery <10%[1]:	Qualify all detects for that analyte as estimated (J). Qualify non-detected compounds as unusable (R).	Parent sample (include field dup)
Matrix Spike/ Matrix Spike Duplicate	All Organic Parameters	If the RPD exceeds the control limit: (Matrix spike duplicates should be evaluated if present, but are not	Qualify all detects for that analyte as estimated (J).	Parent sample (include field dup)

Table A-2: Data Evaluation/Qualification for Organic Methods				
Review Item	Method	Review Criteria	Action	Samples Qualified
Duplicate RPD	Parameters	evaluated if present, but are not required.)		dup)
Field Duplicate Precision	All Organic Parameters	If RPD > UCL: both concentrations < 5X MDL:	No further qualification is required.	Field Duplicate Pair
		If RPD > UCL: either concentration ≥ 5x MDL:	Qualify the detected analyte that exceeded the RPD criteria as estimated (J) in both samples.	Field Duplicate Pair
		If the analyte is detected in one sample, and not the other, and the concentration detected is ≥ 5X the MDL:	Qualify the detected compound as estimated (J), and the non-detected analyte as undetected with an estimated limit of detection.(UJ).	Field Duplicate Pair
Lab replicate precision	Soil gas methods	If RPD > UCL: both concentrations < 5X MDL:	No further qualification is required.	Lab Replicate Pair

Table A-2: Data Evaluation/Qualification for Organic Methods				
Review Item	Method	Review Criteria	Action	Samples Qualified
		If RPD > UCL: either concentration ≥ 5x MDL:	Qualify the detected analyte that exceeded the RPD criteria as estimated (J) in both samples.	Lab Replicate Pair
		If the analyte is detected in one sample, and not the other, and the concentration detected is ≥ 5X the MDL:	Qualify the detected compound as estimated (J), and the non-detected analyte as undetected with an estimated limit of detection.(UJ).	Lab Replicate Pair
Results Exceeding Calibration Range	All Organic Parameters	If the compound concentration exceeds the highest calibration standard and no dilution is performed:	Qualify analyte specific results as estimated (J)	Sample
Compounds detected below Method Quantitation Limit (MQL)	All Organic Parameters	If the analyte concentration is less than the MQL or lowest calibration standard (The MQL should be at or above the lowest calibration standard).	Qualify affected results as estimated (J)	Sample

Table A-2: Data Evaluation/Qualification for Organic Methods				
Review Item	Method	Review Criteria	Action	Samples Qualified
Limit (MQL)				

Appendix B

Health and Safety Design Analysis

SOUTH PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

HEALTH AND SAFETY DESIGN ANALYSIS FOR REMOVAL ACTION OF SPD LABORATORY BUILDING

SEPTEMBER 2005

PREPARED BY:

U.S. ARMY CORPS of ENGINEERS
Sacramento District
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DRAFT HEALTH AND SAFETY DESIGN ANALYSIS
REMOVAL ACTION OF THE
SOUTH PACIFIC DIVISION LABORATORY BUILDING
SAUSALITO, CALIFORNIA

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LIST OF ACRONYMS

- ACGIH American Conference of Governmental Industrial Hygienist
- AHA Activity Hazard Analysis
- ANSI American National Standards Institute
- APR Air Purifying Respirator
- bgs below ground surface
- CESPK U.S. Army Corps of Engineers-Sacramento District
- CFR Code of Federal Regulations
- CO Contracting Officer
- COCs Contaminants of Concern
- Cu yd cubic yards
- dBA decibels
- EPA Environmental Protection Agency
- EZ Exclusion Zone
- HEPA High Efficiency Particulate Air
- HSDA Health and Safety Design Analysis
- HTRW Hazardous, Toxic, and Radioactive Waste
- IDLH Immediately Dangerous to Life or Health
- mg/kg milligrams per kilogram
- MDC Maximum Detected Concentration
- MSDS Material Safety Data Sheets
- MVN West Nile Virus
- NIOSH National Institute of Occupational Safety and Health
- OEL Occupational Exposure Limit
- PPE personal protective equipment
- PVC polyvinyl chloride
- SPD Lab South Pacific Division Laboratory
- SSHP Site-specific Health and Safety Plan
- TLV/TWA Threshold Limit Value/Time Weighted Average
- USACE United States Army Corps of Engineers
- VOCs volatile organic compound

1.0 ***INTRODUCTION***

A Health and Safety Analysis (HSDA) is used as the basis for developing Specifications and later Site-Specific Safety and Health Plans for work at hazardous, toxic and radioactive waste sites. Specifically, it provides the rationale and decision log for the information to be addressed in the specifications, while the specifications specify the items to be included in the contractor's Site Safety and Health Plan (SSHP). In addition to the detailed requirements of the HSDA, work shall be performed in accordance with requirements of EM 385-1-1 and applicable regulations including, but not limited to 8 CCR, Subchapter 7 Section 3203, and the accepted APP/IIPP with Appendices. Matters of interpretation of the standards shall be resolved to the satisfaction of and with the concurrence of, the Contracting Officer before starting work. Where these requirements vary, the most stringent shall apply. The following State and local statutes, regulations and requirements apply to control activities to be performed: Cal-OSHA.

1.1 Accident Prevention Plan (APP)Injury and Illness Prevention Program (IIPP)

1.1.1 APP/IIPP Content and Organization

The Contractor's App/IIPP shall be organized into 5 parts, consisting of overall plan and Appendices.

1.1.1.1.*Overall Accident Prevention Plan*

The overall plan address each element in Appendix A of EM 385-1-1 in project specific detail. The elements are:

a. Signature Sheet.
b. Background Information
c. Statement of Safety and Health Policy
d. Responsibilities and Lines of Authorities.
e. Subcontractors and Suppliers.
f. Training.
g. Safety and Health Inspections.
h. Safety and Health Expectations, Incentive Programs and Compliance.
i. Accident Reporting.
j. Medical Support.
k. Corporate Plans and Programs required by this contract, (HAZCOM, Respiratory Protection)

1.1.1.2.*Overall Injury and Illness Prevention Program*

More specific operational procedures shall be detailed in the required Accident Prevention Plan (APPP)/ Injury Prevention Program (IIPP) and its subcomponents, the Activity Hazard Analyses required in SAFETY AND HEALTH PROGRAM AND PLANS.

NOTE: Any reference to the Accident Prevention Plan shall be considered a reference to the APP/IIPP throughout this section.
NOTE: Although Federal OSHA standards are referenced in this section, the Contractor shall use the corresponding CAL-OSHA standards or the more restrictive of the CAL-OSHA OR Fed OSHA standards.

1.1.1.3 *Chemical Hazard Control Plan Appendices*

The chemical hazard control Appendix shall address occupational exposure issues and shall describe the procedures to be followed to protect employees from chemical hazards while performing excavation activities.

1.1.1.4 *Activity Hazard Analyses Appendix*

An Activity Hazard Analysis (AHA) shall be prepared for each work task data element. The AHA shall be submitted to the Contracting Officer prior to beginning specified work. Format shall be in accordance with EM 385-1-1, figure 1-1. The AHA shall be continuously reviewed and modified, when appropriate, to address changing conditions or operations. Each accepted AHA shall be appended to and become part of the APP.

1.2 ***GENERAL***

1.2.1 This HSDA provides safety and health criteria and practices to address protection of on-site personnel, the public, and the environment from physical and chemical hazards unique to the Removal Action for the South Pacific Division Laboratory (SPD Lab), located 25 Liberty Ship Way, Sausalito, California. Both the HSDA and the contractor SSHP follow the format provided in Appendix C of USACE EM 385-1-92, dated July 2003. The resulting contractor SSHP will be reviewed and approved by the USACE, Sacramento Division (CESPK) Contracting Officer (CO) prior to initiation of site field activities. The contractor's SSHP and subsequent activities must comply with the following referenced documents, at a minimum:

a. 29 CFR 1910.120 and 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response.

b. USACE Safety and Health Requirements Manual: EM 385-1-1.

c. Safety and Occupational Health Document Requirements for Hazardous, Toxic and Radioactive Waste (HTRW) and ordnance and Explosive Waste (OEW) Activities: ER 385-1-92.

d. NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Activities.

e. Cal-OSHA, Title 8 CCR, Sections, 1508-1526

1.2.2 Except in emergency situations, no deviations from the contractor SSHP may be implemented without the prior notification and approval of the site safety and health manager (SSHO) and CO.

2.0 ***SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION***

2.1 *SITE DESCRIPTION*

The site is approximately 2 acres in size and lies along the Richardson Bay waterfront in Sausalito (Figure 1). The primary building on the site is a two-story structure that served as the laboratory. In addition a small chemical storage building and a fenced equipment storage yard are present. The parcel is almost entirely paved and lies in the midst of an industrial/commercial area.

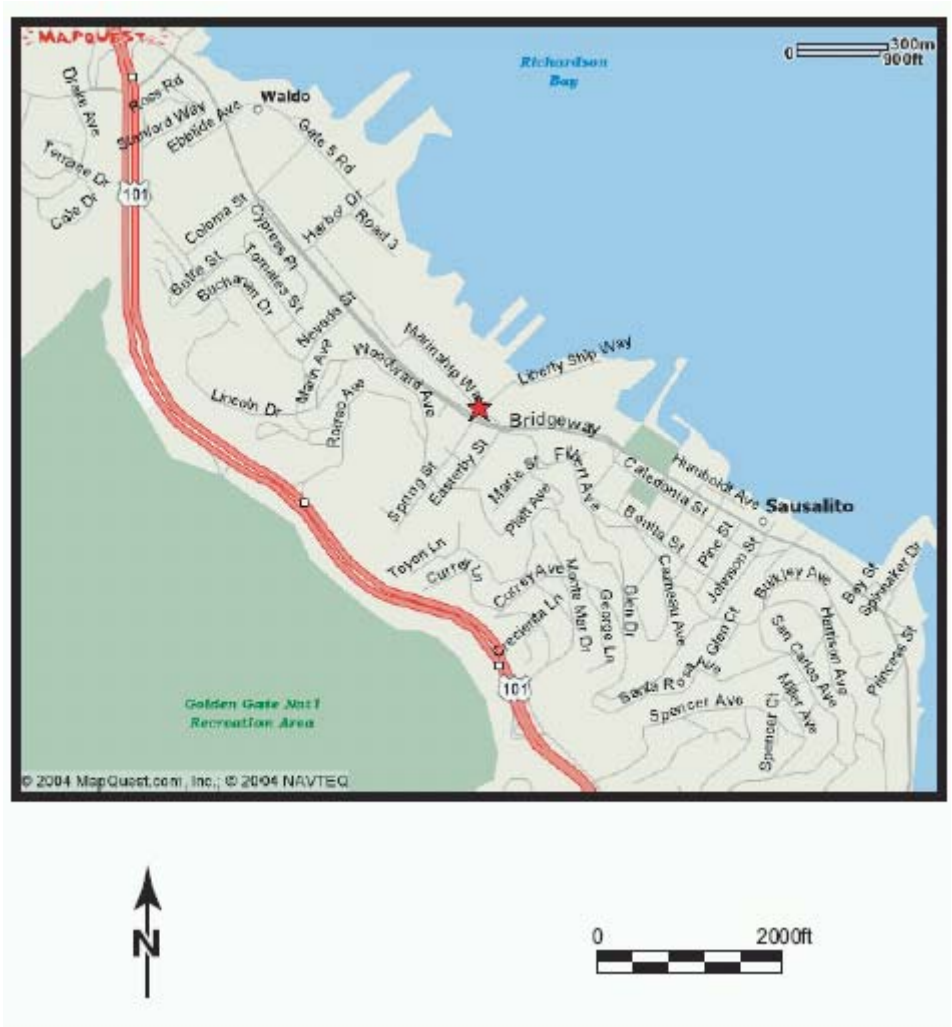


Figure 1. Location of the SPD Laboratory, Sausalito, California.

2.1.1 Site History

2.1.2 The area surrounding the site was first developed in the 1870's when the former Northwestern Pacific Railroad rail yard was constructed. Prior to this the area was a tidally influenced marsh. The rail yard was replaced in 1942 with the Marinship Corporation Shipyard. Many of the buildings currently in the area, including a machine shop destined to become the SPD Laboratory building, were constructed at this time. In 1946 the Marinship shipyard was placed with the War Assets Administration, which in turn transferred the subject parcel to the U.S. Army Corps of Engineers in 1948. The former machine shop was converted to a geotechnical testing laboratory in 1950 and the analytical laboratory capability was added in the early 1990's. The SPD Laboratory closed in 1997.

2.2 CONTAMINANT CHARACTERIZATION

The Remedial Investigation was conducted by the Army in 2001/2002. The goal was to further investigate arsenic in soils, to delineate the extent of PCE in groundwater, and to establish the lateral and vertical extent of PCBs in soil. A radiological survey was also performed. Ten soil borings were advanced and 13 test pits were excavated for soil and "grab" groundwater sample collection. The analytical methods used during the remedial investigation were similar to those used during the site investigation, with the exception of the addition of immunoassay PCB test kits. The test pits and immunoassay PCB analysis were used to delineate the extent of the PCB contamination near the holding tank. This investigation confirmed the presence of petroleum hydrocarbons, polycyclic aromatic hydrocarbons and arsenic in the soil. Petroleum hydrocarbons (diesel range or higher), toluene, xylenes and pentachlorophenol (PCP) were found in the groundwater. The metals detected in the groundwater are not thought to represent contamination. With the exception of the area near the holding tank, the PCBs in soil were sporadically distributed and did not appear to represent a large mass. Petroleum hydrocarbon contamination was widely distributed across the site (at concentrations up to 470 mg/kg) but was not judged to represent a health threat or a significant risk to groundwater quality (ITSI, 2003).

Table 1- Chemicals of Concern (COCs)

COC	Maximum Soil Conc , mg/kg
PCB's (Arochlor)	110
Petroleum Hydrocarbons (Diesel)	30
Polycyclic aromatic hydrocarbons (Motor Oil)	470
Lead	25
Arsenic	30 [L5]

3.0 ***HAZARD/RISK ANALYSIS***

3.1 REMOVAL ACTION TASKS

3.11 The project goal is to remove PCB contaminated soil located between the former SPD Laboratory and the Bay Model building (a PCB soil hot spot). In addition, to the removal of contaminated soil the underground storage tank (located within the removal area), will be removed. The two 20-foot by 20 foot excavations will be dug to a depth of 4-feet below ground surface. The larger excavation (20-foot by 45-foot) shall be dug to a depth of 5-feet below the ground surface. The total estimated area for the excavation is 1700 square feet. The total estimated excavation volume is 285 cubic yards. A combination of both heavy equipment and hand excavation tools will likely be necessary at this site due to numerous underground utility lines. The removal action is not expected to reach the ground water which is estimated to be encountered at 6 to 12 feet below the ground surface (bgs). This action, when combined with the paving, will reduce the potential for exposure to both workers and visitors to the area. The holding tank will be sent to an appropriate recycling facility. The excavated soil is to be disposed of at a permitted facility.

3.12 detailed description of the removal action can be found in the work plan. The tasks required to achieve the removal action measure include the following:

- Excavate Area
- Tank Removal
- Asphalt as required for cover application.

3.2 ***SAFETY HAZARDS***

Safety hazards associated with the removal action include exposure to open excavations up to 5-foot below ground level, heavy equipment operation, hazards with moving equipment and machinery, buried and overhead utilities, electrical, heavy lifting, slip, trip, falls and motor vehicles moving about the site. The contractor shall ensure that the controls implemented to address these safety hazards comply with applicable sections of EM 385-1-1. In addition to the federal regulations a contractor must obtain a permit for construction activities for five feet or deeper and into which a person is required to descend. 8 CCR, Chapter 4, Subchapter 4. A permit can be obtained from the following Cal-OSHA office:

CAL-OSHA Consultation Services
Oakland/SF Bay Area
1515 Clay Street, Suite 1103
Oakland, CA 94612
(510) 622-2891

3.3 ***CHEMICAL HAZARDS***

3.3.1 As stated in Section 2.2, Table 1. PCB's, Petroleum Hydrocarbons (Diesel), Polycyclic Aromatic Hydrocarbons (Motor Oil), Arsenic and Lead, are the contaminants of concern. The routes of exposure that can be anticipated for these tasks are inhalation of dry contaminated soil, direct skin contact with contaminated soil and incidental ingestion of airborne contaminated soil. Arsenic is considered to be a carcinogen under Cal-OSHA, 8 CCR, Chapter 4, Subchapter 7, Article110. Contractor Registration can be done at the following address:

CAL-OSHA District Offices (Asbestos Contractor/Occupational Carcinogen Control)
455 Golden Gate Ave, Room 1524
San Francisco, 94102
(415) 703-5210

3.3.2 Toxic hazards to site personnel associated with the suspected site contaminants can be assessed through comparison of actual exposures with several established occupational exposure limits. Permissible Exposure Limits (PELs) are established by federal OSHA. Cal-OSHA PELs are more restrictive than Federal OSHA. Recommended Exposure Threshold Limit Values/Time Weighted Averages (TLV/TWAs) are established by the American Conference of Governmental Industrial Hygienists (ACGIH). Immediately Dangerous to Life or Health (IDLH) values are established by NIOSH.

These occupational exposure limits are described as follows:

a. Permissible exposure limits are established by Cal-OSHA. PELs may be expressed as an 8-hour TWA or as a ceiling limit. Ceiling limits may not

be exceeded at any time. PELs are enforceable by law and are more stringent than Federal OSHA requirements.

b. Permissible exposure limits are established by federal OSHA. PELs may be expressed as an 8-hour TWA or as a ceiling limit. Ceiling limits may not be exceeded at any time. PELs are enforceable by law.

c. The ACGIH TLV/TWA is defined as the airborne concentration of a substance to which nearly all workers (8 hours per day, 40 hours per week) may be repeatedly exposed, day after day, without experiencing adverse health effects. For some substances, the overall exposure to a substance is enhanced by skin, mucous membrane, or eye contact. These substances are identified by notation (s) following the TLV/TWA values. Other substances have a ceiling value (c), which may not be exceeded during any part of the working exposure.

d. IDLH: The maximum airborne concentration of a substance which one could escape within 30 minutes without escape-impairing symptoms or any irreversible health effects.

3.3.3 Table 2- presents occupational exposure limits and general toxicological information for the site COCs including: OSHA PELs, Cal-OSHA PELs, ACGIH TLV/TWAs, and IDLH values. Alternate workplace standards recommended in publications related to workplace exposure criteria, such as the Threshold Limit Values and Biological Indices by the American Conference of Governmental Hygienists, shall be used in lieu of OSHA standards where OSHA standards are less stringent or do not exist.

Table 2 – Occupational Health Exposure and Toxicological Properties for Contaminants of Concerns

Cont of Conc	*Cal-OSHA PEL*	*OSHA PEL*	*ACGIH TLV*	*IDLH*	*TARGET ORGANS*	*ROUTES OF EXP*	*SYMPTOM OF EXP*
PCB's	0.5 mg/m3	0.5 mg/m3	0.5 mg/kg	5 mg/kg	Respiratory system, eye irritant,skin	Inhalation, Ingestion,skin contact	skin/eye/mucous irritation, dizziness, nauseous, diarrhea
LEAD	.5 mg/m3	<0.1 mg/m3	0.05 mg/m3	100 mg/m3	Eyes, GI tract, CNS, kidneys, blood, gingival tissue	Inhalation, Ingestion, Skin Contact	Weak, insomnia, facial pallor, constipation, anemia, colic, abdominal pain
Diesel	NE	NE	NE	5 mg/m3	Skin,	Skin	Irritation of the

					repiratory system, kidneys	irritation, Inhalation, Ingestion	skin
Motor Oil	NE	NE	NE	5 mg/m3	Skin, respiratory, kidney system	Skin irritation, Inhalation, Ingestion	Irritation of the skin
Arsenic	0.05 mg/m3	N/A	N/A	5 mg AS/m3	Eyes, skin,GI, CNS,Respiratory system, liver, reproductive system.	Inhalation, Ingestion, skin and/or eye contact	Irritation of skin, repiratory distress, diarrhea, kidney damage

3.3.4 The Contractor should include Material Safety Data Sheets (MSDSs) for each known or anticipated chemical being brought to the site in support of the removal action work.

3.4 ***PHYSICAL HAZARDS***

Physical hazards that can be anticipated for this project include: noise from operating equipment, fire from flammable material, and excavation hazards, faulty electrical connections, and heat or cold stress (depending on the time of year). The contractor's SSHP should evaluate controls that can be implemented to lower the noise exposure during equipment operation as well as control for temperature extremes. An example would be the specification of heavy equipment with enclosed cabs that have heating and/or air conditioning.

3.5 ***RADIOLOGICAL HAZARDS***

None of the site history or background about SPD Lab indicates that ionizing radiation is a threat to site personnel. If the contractor plans to utilize nuclear sourced equipment (i.e., soil compaction nuclear density gauge) then the radiological hazards associated with this equipment will be addressed in the contractor's SSHP.

3.6 ***BIOLOGICAL HAZARDS***

Snakes and insects are found throughout the area at SPD Lab. Possible cover and habitat for these shall be minimized in the field operations area (i.e., weed control, organized storage). West Nile Virus (WNV) is a potentially fatal disease which is spread by infected mosquitoes. Mosquitoes are WNV carriers that become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite. Hantavirus exposure is also a potential hazard while performing tasks at SPD Lab. Potential risk factors for

hanta virus exposure include disturbing mice nests or areas with visible mouse droppings. The contactor's SSHP should address personnel awareness of the potential biological risks, and provide guidance for controlling the hazards or safely decontaminating.

3.7 ***ACTION LEVELS FOR MITIGATING SITE HAZARDS***

The contractor's SSHP shall address their specific means of controlling and mitigating the safety, chemical, physical and biological hazards identified above. Specifically action levels for the following shall be addressed:

- Implementation of engineering controls: for example use of ventilation and institution of dust control measures, air conditioned cabs on heavy equipment and limiting the number of people allowed in the work zone.
- Upgrading and downgrading levels of personal protective equipment based on personal air monitoring or dust monitoring.
- Stopping work or evacuating the site based on air monitoring or a physical catastrophe such as fire.
- Preventing exposure to the public and non-workers at the site through access control.
  Distance restrictions for operation of equipment near overhead power lines shall be established based on OSHA requirements in 29CFR1910.333 and 29CFR1926.416.
  Implement levels for heat and cold stress monitoring.

4.0 ***STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES***

Implementation of the Contractor SSHP should be accomplished through an integrated effort of the following Contractor personnel: project manger, project engineer, certified industrial hygienist or certified safety professional, site safety and health officer, and trained workforce. The contractor's SSHP shall indicate the lines of authority and responsibilities for each identified persons. It shall also include the mechanism employed for coordinating and controlling the work activities of subcontractors and suppliers. At least two people at the site must be trained in first aid and cardiopulmonary resuscitation (CPR).

5.0 ***TRAINING***

The Contractor should include in the SSHP an employee HAZWOPER training program complying with, but not necessarily limited to those requirements specified and approved of by the Corps of Engineers in EM 385-1-1 and in OSHA (CFR, 1910.120), that includes training on hazardous waste operations, PPE use, heavy equipment operation, confined space entry, and annual follow-up training. While the 1910.120 regulations provide for varying levels of training based on job function, the USACE policy is to require the following:

- A minimum of 40-hours of hazardous, toxic and radioactive waste health and safety training off site.
- Three days or 24 hours of actual field experience under the direction of a trained supervisor.
    - 8 hours of refresher training, annually.
    - On site supervisors shall have an additional 8 hours of training covering the employers
    - Safety and health program, personal protective equipment program, spill containment and health and hazard monitoring
- Pre-entry briefing covering the contractor's SSHP. This will include training on chemical Biological, and physical hazards communications.
- At least two persons currently certified in First Aid/Cardiopulmonary Resuscitation Provided by the American Red Cross or equivalent agency, shall be present on site at all times.
- Hazard Communication training
- Use of engineering controls and good work practices to limit occupational exposure
- Employee right of access to medical surveillance records as specified in 29 CFR 1910 (.20).

5.1.1 *Site Safety and Health Officer (SSHO)*

The site safety and health officer shall meet the training requirements in paragraph 5.0 and shall meet the training experience and authority requirements to be a competent person for this type of project.

5.1.2 *Site Workers*

Site workers for this project must meet at a minimum all training requirements in paragraph 5.0 to include any project specific issues such as underground utilities and requirements for excavation near building foundations.

6.0 ***PERSONAL PROTECTIVE EQUIPMENT***

6.1 *GENERAL*

The Contractor should provide all Contractor personnel with appropriate personal safety equipment and protective equipment and protective clothing, and should ensure that all safety equipment and protective clothing is kept clean and well maintained. The Contractor should also maintain an inventory of Level C personal protective equipment enough for two governmental personnel, and up to two site visitors per day. Based on the assessment provided in Section 8.0 below, it is anticipated that the removal action work can be accomplished in Level D personal protective equipment (PPE). However, the contractor must verify this assessment and allow for upgrading PPE based on actual site condition.

6.2 *LEVEL D PPE*

6.2.1 Level D protection shall be used under the following conditions:
The atmosphere contains no known hazard above individual or combined permissible exposure limits (PELs), essentially nuisance contamination only;

-
The atmosphere must contain 19.5 percent oxygen.

The atmosphere contains no known hazard above individual or combined permissible exposure limits (PELs)

-
Concentrations of airborne toxic compounds do not exceed normal background concentrations or specified action levels requiring use of respiratory protective equipment.

Work functions preclude splashes, immersion in, unexpected inhalation of, or direct contact with hazardous concentrations of harmful chemicals.

6.2.2 Level D protective equipment shall consist of the following, unless otherwise stated in the contractor's SSHP:

- Dedicated work uniforms with long pants and sleeved shirts. These may include: Chemical resistant overalls, Standard Tyvek coveralls, or standard cotton (or cotton) work uniforms,
- Safety shoes or boots (Leather, PVC, or Rubber) meeting the specifications of American National Standards Institute (ANSI) Z41.
- Gloves; these may include: heavy work gloves (e.g., cotton or leather), impervious gloves (polyvinyl alcohol (if not handling water), 4H or Silver Shield). In general, it is recommended that an impervious glove be worn during all site activities that could result in direct contact with potentially contaminated soil, water or other items;
- Safety glasses, goggles, face shield or other approved eye protection. All approved eye protection must meet the specifications of ANSI Z87.1. The use of contact lenses is discouraged during Level D operations, but not prohibited. Safety glasses or goggles are required.
- Hard hat, unless specifically stated otherwise. All approved hard hats must meet the specifications of ANZI Z89.1.
- Escape breathing apparatus, when potential site conditions warrant; and/or
- Hearing protection (muff or plugs) as necessary depending on measured decibel readings in the field. The protective device must have a noise reduction rating capable of providing the wearer with enough protection so as to reduce the received noise level to below 85 dBA.
- Reflective Traffic Vests.

6.3 *LEVEL C PPE*

6.3.1 Level C protection shall be used under the following conditions:

- Concentration of known airborne organic compounds or dust in the breathing zone is above the action levels given in Contractor's SSHP for individual work tasks;
- The types of air contaminants have been identified, concentrations measured, and an APR, and chemically protective clothing are available that can protect against the identified contaminants;
- The substance(s) has adequate warning properties, and the criteria for the use of an APR have been met;
- The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin; and
- The atmosphere contains at least 19.5 percent oxygen.

6.3.2 If Level C is required, the Contractor must provide a respiratory protection program that includes a written program, medical evaluations, personal monitoring or assessment, training, fit testing and maintenance. Level C protective equipment shall consist of the following:

- Chemical-resistant coveralls. This may include polyethylene coated Tyvek, or Saranex.
- Safety shoes with disposable boots covers or, Chemical-resistant steel toed boots, meeting the specifications of ANSI Z41;
- Chemical resistant gloves. This includes: disposable inner and outer gloves, such as polyvinyl alcohol and 4H or Silver Shield.
- Work gloves as necessary to prevent cuts, scrapes, and pinches;
- Half-faced or full-faced APR with combination organic vapor HEPA (P100) cartridges for individual work tasks;
- Safety glasses, goggles or faceshield when wearing a half-face APR, meeting the specifications of ANSI Z87.1;
- Hard hat, unless specifically stated otherwise, meeting the specifications of ANSI Z89.1;
- Cuffs sealed to boots or gloves with duct tape, or equivalent; and
- Hearing protection as necessary depending on measured decibel readings in the field. The protective device must have a noise reduction rating capable of providing the wearer with enough protection as to reduce the received noise level below 85 dBa.

6.4 ***OTHER***

Levels B and A are not anticipated to be necessary for this removal action field project. The contractor's SSHP, however, must address the contractor's assessment level of PPE needed to complete the work safely.

7.0 ***MEDICAL SURVEILLANCE***

7.1 *MEDICAL SURVEILLANCE PROGRAM*

7.1.1 The Contractor should write and include in the SSHP a medical surveillance program that includes scheduling of examinations, certification of fitness, compliance with OSHA requirements for hazardous waste operations and respiratory protective equipment use, and information provided to the physician.

7.1.2 The Contractor shall employ the services of an occupational or board certified or board eligible health physician to determine the minimum content and frequency of examinations for their personnel. The determination shall be based on probable site conditions and tasks, exposure to the COC's and the use of protective equipment. The occupational health physician shall certify employee fitness for duty. A copy of each employee's certification shall be included as an appendix to the Contractor's SSHP.

7.2 ***EMERGENCY MEDICAL ASSISSTANCE***

7.2.1 Prior to work start-up, the Contractor should establish an emergency medical assistance network. The Fire Department, ambulance service, and clinic or hospital emergency room should be identified and phone numbers for these services posted in a conspicuous place at the project site. A map and directions indicating the fastest route to the hospital emergency room should also be posted. A copy of the map with a route to the hospital is included in this document as Figure 7-1. The hospital information is given below.

UCSF Mount Zion Hospital
1710 Scott Street #1
San Francisco, California
Phone: 415-567-0304

7.2.2 A vehicle should be available on-site during all work activities to transport injured personnel to be identified emergency medical facilities. The Contractor should make a suitable first-aid kit available at the site for use by trained personnel. The first aid kit shall contain enough supplies to service the number of people on site and shall be approved by the occupational health physician. A supply of fresh water or a portable emergency eye wash with a minimum 5-gallon capacity and 15-minute duration should also be available at the work site. The Contractor should notify the medical facility to be used in emergencies of the approximate duration of work at the site, and provide a list of contaminants expected to be encountered prior to beginning work at the site.

8.0 ***EXPOSURE MONITORING/AIR SAMPLING PROGRAM***

8.0.1 The MDC can be used to estimate a worst case COC concentration in lowest estimated levels of visible dust. This estimate can be compared against the COCs, IDLH, PEL, and TLVs, to determine sampling and monitoring requirements. This information is provided in Table 3.

8.0.2 Dust controls including but not limited to engineering and administrative controls such as wetting the soil during handling, applying surfactants to prevent wind blown dust, selection of excavation equipment and techniques to reduce dust creation will be critical to controlling exposures to COCs. These controls should be implemented to control dust generation to a level not visible (generally accepted to be approximately 2 mg/m3 airborne dust).

8.0.3 The Contractor should include in the SSHP an air sampling and screening program for all site operations. The program should establish reporting requirements and notification procedures. Air monitoring may be performed to assess the degree of Exposure to PCB'S and Lead during the invasive soil operations. However, the information provided in Table 3 indicates that at the MDC levels, a visible amount of dust would be required to reach the occupational exposure limits (OEL) for the COCs. In the event of strong petroleum odors or if POL liquid is encountered a PID should be available. A monitoring program would serve to evaluate the adequacy of the level of personal protective equipment being used. Personnel should be done by an examining physician which would determine if more frequent surveillance is necessary, or if increased sampling frequency is required by the Contractor's industrial hygienist.

8.0.4 Should the Contractor decide to collect personal air samples for PCB's Arsenic, and Lead, the sampling program shall be supervised by the Contractor's certified industrial hygienist (CIH). The samples shall be analyzed by a laboratory participating in the American Industrial Hygiene Association Proficiency Analytical Testing program and shall have as fast a turn-a-round time as possible.

8.0.5 The contractor's SSHP shall provide for the evaluation of noise form all field operations that may expose workers to noise levels at or above 85 dBA. The noise monitoring shall be sufficient enough to determine if workers need to participate in a hearing conservation program and use hearing protection. Note that hearing protection is required for all exposures greater than 85 dBA.

Table 3 – Estimated COC concentration in visible Dust

Chemical	*Exposure Limit*	*Maximum Soil Conc*	*Exp Limit Elmix, mg/m3*	*Dust Quotient for each Cmpd*
PCB's	0.582 mg/m3	110 mg/kg	3.33	4.30E+05

Dust Exposure Level at mixture PEL = 14.16

9.0 ***HEAT/COLD STRESS MONITORING***

9.0.1 The stress of working in a sunny environment can cause a variety of illnesses including heat exhaustion or heat stroke; the latter can be fatal. Use of personal protective equipment can significantly increase heat stress. To reduce or prevent heat stress, the Contractor shall, as required when ambient temperatures exceed 70 degrees Fahrenheit, implement scheduled rest periods and require controlled beverage consumption to replace body fluids and salts. The following procedures and action levels may be used, depending upon ambient site conditions, by the Contractor to monitor potential heat stress:

a. Heart Rate. Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate exceeds 110 beats per minute at the next rest period, shorten the following work cycle by another one-third and also monitor oral temperature.

b. Oral Temperature. Use a clinical thermometer (three minutes under the tongue) to measure the oral temperature at the end of the work period (before drinking). If the oral temperature exceeds 99.6 degrees Fahrenheit, shorten the next work cycle by one-third without changing the rest period. If the oral temperature exceeds 99.6 degrees Fahrenheit at the beginning of the next rest period, shorten the following work cycle by another one-third. Field team members shall not be allowed to wear Level C PPE when oral temperatures exceed 100.6 degrees Fahrenheit.

9.0.2 Personnel shall be trained to recognize the symptoms of heat stress and the appropriate action to take upon recognition. Even though physiological monitoring is not always necessary, it is essential that personnel understand the significance of heat stress and it recognition. The Contractor should refer to the section on heat stress in the NIOSH/OSHA/USCG/EPA document, "Occupational Safety and Health Guidance Manual for Hazardous Waste Sites Activities, " published by the U.S. Department of Health and Human Services in March 22, 2005.

9.0.3 Cold Stress Monitoring. During the winter months, cold stress may be an occupational stress, which needs consideration during the removal action work. Frostbite and hypothermia are the primary concerns. The SSHP shall contain information about the signs and symptoms of frostbite and describe work practices that will reduce the risk of injury. To reduce or prevent cold stress, the Contractor shall, as required when ambient temperatures are below 40 degrees Fahrenheit, implement work practices that will reduce the risk of injury due to frostbite or hypothermia. The Contractor shall use current guidance by the ACGIH in Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices in developing work practice controls.

10.0 ***STANDARD OPERATING SAFETY PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES***

The Contractor's SSHP shall address the implementation of feasible engineering and work practice controls to reduce and maintain employee exposure at or below the OSHA Permissible Exposure Limits (PELs) for the COC's. Specifically, the Contractor's SSHP must indicate methods of achieving the following:

- The buddy system
- Prohibitions such as eating, drinking or smoking in the work zones
- Required permits, such as for excavations, and hot work.
- Material handling procedures
- Confined space entry – indicate negative declaration if no confined space entries will be required
- Electrical Safety
- Lockout/Tagout
- Equipment guarding
- Excavation and trench safety
- Fall protection
- Hazard Communication for chemicals brought to the site
- Illumination
- Work site sanitation

11.0 ***SITE CONTROL MEASURES***

Site control requires the establishment of a regulated area, designated work zones, and evacuation protocol, and site security. The Contractor SSHP should discuss the establishment of site work zones: exclusion, contamination, reduction, and support. The Contractor's SSHP shall provide a map delineating the zone or modify as site conditions warrant.

11.1 ***WORK ZONES***

11.1.1 The regulated/restricted area, or "hot" zone, is the area where contamination or potential contamination exists. Since this zone has the potential for workers to be exposed to contaminants, all field staff entering this area will wear the appropriate PPE, adhere to the training and medical surveillance requirements presented in this document. Areas with higher concentrations of contaminants within this zone will be identified with field stakes with colored flags. Field personnel entering the exclusion zone or the higher concentration part of the exclusion zone will enter and exit through a controlled center. Prior to field work occurring in this zone, the site safety officer will develop an emergency exit area. The regulated/restricted area will be demarcated by using lines, placards, hazard tape and/or signs, or enclosed by physical barriers, such as chains, fences or ropes.

11.1.2 The support zone, the outermost part of the regulated area, is free from recognized site hazards. Support equipment such as the equipment staging area and vehicles, will be located in this area. Since normal work attire is appropriate within this zone, all potentially contaminated personal protective clothing, equipment and samples will not be permitted, unless properly containerized. The location of the command post and other support facilities in the support zone at each site will depend on a number of factors, including:

- Accessibility: topography, open space available, locations of roads, or other limitations.
- Visibility: line of sight to all activities in t he exclusion zone is preferable.

- Wind direction: the support facilities preferably should be located upwind of the regulated/restricted area. Shifts in wind direction and other conditions may be such that an ideal location based on wind direction alone does not exist.
- Resources: water, electricity, places of refuge.

11.2 ***SITE SECURITY***

11.2.1 Only authorized personnel will enter regulated areas associated with the field activities. The site safety and health officer, will establish the boundary of the regulated/restricted area. The following measures will be taken to assure site security.

- All workers entering the regulated areas will be subject to the provisions of the contractor's SSHP. The site safety officer will have the responsibility and authority to enforce this requirement.
- All workers entering the regulated/restricted area will have the appropriate training, PPE and respiratory protection and will be enrolled in an established medical surveillance program.
- A site Visitor's Logbook, located in the support zone, will be maintained.

11.2.2 Site control at project sites will vary from strict property perimeter controls to no controls at all. When possible various regulatory personnel may request to investigate any suspicious activities at the site. In some cases an independent security watch may be needed. To maintain security at the sites during working hours, the contractor will:

- Control all site entrances/exits through the support zone through installation of appropriate safety barricades, signs, and/or signal lights;
- Establish a personnel identification system, including limitations to an individual's approved activities;
- Be responsible for enforcing entry/exit requirements;
- Utilize temporary fencing, where feasible; and
- Post warning signs around the perimeter of the support zone, should the utilization of temporary fencing not be feasible.

11.2.3 To maintain security during non-working hours, the Contractor will secure the site prior to leaving at the end of a working day. All equipment and supplies will be secured or stored in locked facilities, and open holes and trenches will be covered with plywood or surrounded by a fence, or similar safety provision.

11.3 ***COMMUNICATION SYSTEMS***

Two types of communications systems should be available for all workers assigned to field projects. The Contractor SSHP will specify which types of communication systems will be available. One system will ensure adequate communication between site personnel, and the other will ensure the ability to contact personnel and particularly emergency assistance off the site.

11.3.1 Internal communication is used to:

- Alert team members to emergencies;
- Pass along safety information, such as weather conditions that could affect heat stress, cold stress or general safety, etc.
- Maintain site control; and
- Facilitate site work by being able to call to the appropriate party for information, without having to decontaminate the work party and equipment and secure the site.

11.3.2 Verbal communication can be impeded by onsite background noise and the use of personal protective equipment. Thus, it is vital that pre-arranged signals of communication be arranged prior to the initiation of site activities, particularly when heave equipment work is involved. Common types of internal communication devices include:

- Radios;
- Noisemakers: bell, compressed air horn, megaphone, siren, whistle; and
- Visual signals.

11.3.3 Primary means of external communication devices are telephones, radios, facsimile machines, and computer networks. External communication systems between onsite and offsite personnel are necessary to:

- Coordinate emergency response efforts;
- Report to upper management about site activities; and
- Maintain contact with essential offsite personnel.

12.0 ***PERSONAL AND EQUIPMENT DECONTAMINATION***

12.0.1 Equipment that may require decontamination includes tools, equipment, vehicles (heavy equipment) and certain protective equipment. All material and equipment used for decontamination must be disposed of properly. Disposable clothing, tools buckets, brushes, and all other equipment that is contaminated will be secured in appropriate specification drums or other containers and labeled. Clothing that will be reused, not completely decontaminated on-site, will be secured in plastic bags before being removed from the site.

12.0.2 Decontamination procedures are implemented as a means of control of potential migration of chemicals or other site contaminants to clean areas, and to prevent personnel exposure to chemicals or pathogens, which may contaminate clothing or protective gear. Personnel entering the regulated/restricted area during excavation activities must decontaminate upon exiting from the area. In addition, before demobilization, contaminated equipment will be decontaminated before it is moved into the support zone. Any material that is generated during decontamination procedures and stored until final disposal arrangements are made.

> Note: The type of decontamination solution to be used is dependent on the type of chemical or pathogenic hazard. The Contractor's SSHP will specify decontamination materials when they are different than ordinary soap and water. All personnel will be require do wash their hands (and face optional) with soap before eating, drinking or smoking (unless specific procedures are in place to ensure that a drink can be taken without the possibility of contamination), and

before leaving the contamination reduction zone. Decontamination solutions will be changed daily (at a minimum) and collected and stored on-site until disposal arrangements are finalized.

12.0.3 Portable Equipment Decontamination: Equipment used in the exclusion zone in areas where contact with site contaminants is likely to occur will be protected from contamination as much as possible by measures such as enclosure in plastic bags, or by preventing contact with contaminated materials. Equipment decontamination will be determined by the nature of the equipment and extent of contamination.

12.0.4 Equipment moved from the exclusion zone before the end of the job will undergo a gross decontamination step near work site prior to proceeding to the decontamination area. This step will help to ensure that, as many of the contaminants as possible remain in t he area. This decontamination step will involve scraping and rough brushing to remove dirt and other visible contamination.

12.0.5 Heavy Equipment and vehicle Decontamination: All personnel will go through decontamination before leaving the exclusion zone for the support zone or other clean area. Personnel will also go through decontamination if their protective clothing becomes torn. Personnel may return to the exclusion zone after changing into clean protective gear. The majority of work anticipated at will be conducted in Level D or Level C personal protective equipment. The a typical Level D or Level C decontamination approach associated with a "step-off" decontamination procedure. The decontamination approach presented is applicable to personnel conducting environmental sampling or who come in physical contact with potentially contaminated media.

12.0.6 Emergency Decontamination: It is not anticipated that emergency decontamination of heavy equipment will be necessary. Emergency decontamination of site personnel may be necessary for medical reasons or in the event of major contamination by contact with contaminated material. Emergency procedures will include:

- Assistance by on-site personnel for removal of contaminated protective clothing, when time permits.
- If the situation is life-threatening due to chemical exposure, some form of decontamination or removal of protective clothing will be conducted prior to medical treatment. Emergency personnel will be notified of the nature of the nature of the contaminated material and instructed on the importance of preventing skin contact.
- If the employee can walk or be moved without injury, all affected skin areas should be washed thoroughly with soapy water and rinsed.
- Disposal of equipment will be in appropriate collection containers.
- Non-disposable equipment will be placed and cleansed in the area provided for personnel to wash-down non-disposable equipment.

13.0 ***EMERGENCY RESPONSE PLAN AND EQUIPMENT***

13.0.1 As part of the SSHP, the Contractor should develop an emergency response and contingency plan for on-site emergencies. The Contractor should provide for emergency response equipment and first aid arrangements. At a minimum the Contractor shall address the following:

- Pre-emergency planning
- Personnel roles, lines of authority, training, and communication
- Emergency recognition and prevention
- Safe distances and places of refuge
- Site security and control
- Evacuation routes and procedures
- Decontamination
- Emergency medical treatment and first aid
- Emergency altering and response procedures
- Critique of response and follow-up
- Personal protective equipment and emergency equipment

13.0.2 All emergency plans shall include elements to protect the local affected population in the event of an accident or emergency. These are the names of personnel responsible of responding in the event of an emergency, first aid and medical attention; and air monitoring.

13.0.3 Spill and Discharge Control: The Contractor should be responsible for developing, implementing, maintaining, and supervising a comprehensive Spill and Discharge Control Plan. The plan should be submitted to the Contracting Officer (CO) for approval and should be a component of the Site Safety and Health Plan (SSHP). This plan should provide contingency measures for potential spills and discharge from potentially hazardous on-site materials or trucks transporting hazardous materials offsite.

EMERGENCY RESPONSE CONTACTS
All emergency response issues such as fire, security or emergency medical services are handled by dialing 911.

Table 4 – Emergency Contacts

Paul Feldman Project Manager US Army Corps Sacramento District	1325 J Street Sacramento, CA 95814-2922 Phone:(916) 557-7817 Fax: (916) 557-7865
Charles Ridenour Chief, Federal Facilities Unit Department of Toxic Substances Control	8800 Cal Center Drive Sacramento, CA 95826-3200 Phone: (916) 255-3571 Fax: (916) 255-3734
Laurent Miller Remedial project Manager San Francisco Bay, Regional Water Board	1515 Clay Street, Suite 1400 Oakland, CA 94612 Phone: (510) 622-2440 Fax: (510) 622-2458

14.0 ***ACCIDENT PREVENTION***

14.0.1 Any additional accident prevention plan topics not otherwise covered in this HSDA that are required by EM 385-1-1shall be addressed in the Contractor SSHP. For example, EM 385-1-1, Figure 1-2, requires that an activity hazard analysis (AHA be developed for each set of tasks. The AHA describes each step of each tasks, identifies the potential chemical, biological and safety hazards associated with each step and the controls to be implemented. Additionally, it lists equipment to be used, training and inspection requirements. The Contractor shall include in the SSHP an AHA for each set of tasks to be performed (e.g., excavation, asphalt application, tank removal and the collection of confirmation soil samples, etc.).

14.0.2 The Contractor is responsible to conduct daily safety inspections to ensure that the SSHP is being followed and is effective.

14.0.3 In the event of an accident, the Contracting Officer shall be notified according to the following, using ENG Form 3394, March 99.

Class A Accident: An accident in which the resulting total cost of property damage and personal injuries is $100,000 or greater; or an injury or occupational illness resulting in a fatality or permanent total disability.

Class B Accident: An accident in which the resulting total cost of property damage and personal injuries is $200,000 or more but less than $100,000; or an injury or occupational illness resulting in permanent partial disability or hospitalization of five or more from a single occurrence.

Class C Accident: An accident in which the resulting total cost of property damage and personal injuries is $10,000 or more but less than $2,000; or an injury or occupational illness that results in a lost workday case with days away from work.

Class D Accident: An accident in which the resulting total cost of property damage and personal injuries is $2,000 but less than $10,000, or an injury or occupational illness that resulting in a lost workday case, with one or more days of restricted work activity, or a nonfatal case without lost workday.

15.0 ***LOGS, REPORTS, AND RECORDKEEPING***

15.0.1 The Contractor should maintain logs and records that relate to all aspects of the Contractor SSHP implementation. These records shall be submitted to the Contracting Officer. They should include:

- Training log of 40-hour initial and 3-day supervised field training
- Supervisory certifications
- 8-hour annual refresher training
- Medical surveillance program fitness for duty
- First aid and CPR certification

- Site Specific indoctrination
- Tailgate meetings
- Visitor register
- Daily inspections (may be part of the quality control report)
- OSHA 300 log
- Safety and health program documents, such as the SSHP
- Equipment maintenance
- Exposure assessment monitoring

16.0 ***REFERENCES***

Innovative Technical solutions, Inc. (ITSI), 1998. *Final preliminary Environmental Assessment,* US *Army Corps of Engineers, South Pacific Division Laboratory, 25 Liberty Ship Way, Sausalito, California.* September.

ITSI, 1999. *Final Phase II Remedial Investigation Report, USACE South Pacific Division Laboratory, Sausalito, California*. Volumes I and II. January.

Figure 7-1 Hospital Map

	Distance	Maps
Total Est. Time: 15 minutes **Total Est. Distance:** 9.67 miles		
1: Start out going SOUTHWEST on LIBERTY SHIP WAY toward MARINSHIP WAY.	<0.1 miles	Map
2: Turn LEFT onto MARINSHIP WAY.	<0.1 miles	Map
3: Turn RIGHT onto BRIDGEWAY.	1.0 miles	Map
4: Turn LEFT onto BRIDGE BLVD.	0.1 miles	Map
5: Merge onto US-101 S toward SAN FRANCISCO (Portions toll).	7.3 miles	Map
6: Turn RIGHT onto DIVISADERO ST.	1.0 miles	Map
7: End at **Ucsf Mount Zion Medical Ctr** 415-885-7304 1600 Divisadero St # B218, San Francisco, CA 94115 US		Map

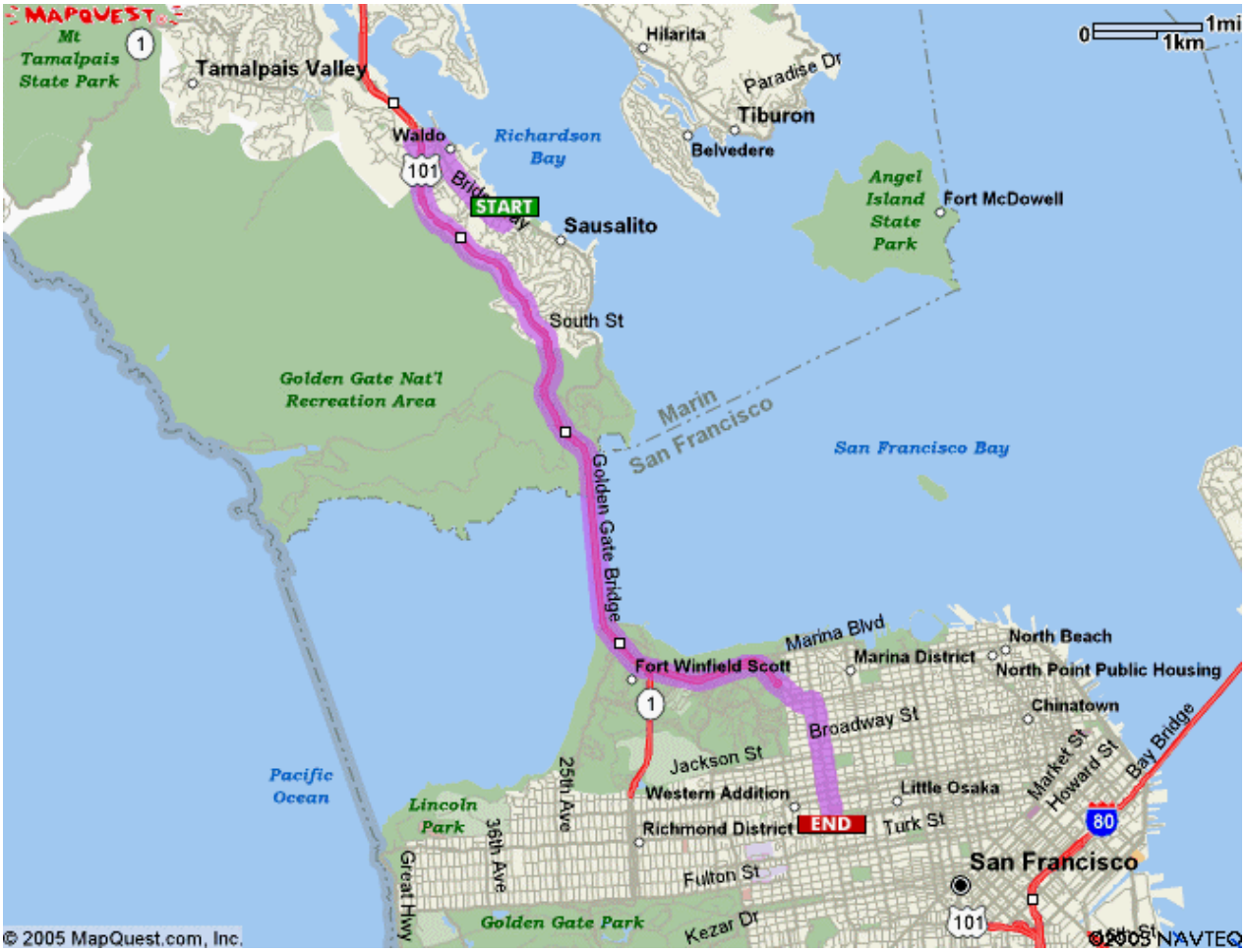
Total Est. Time: 15 minutes **Total Est. Distance:** 9.67 miles

1:	Start out going SOUTHWEST on LIBERTY SHIP WAY toward MARINSHIP WAY.	<0.1 miles	Map
2:	Turn LEFT onto MARINSHIP WAY.	<0.1 miles	Map
3:	Turn RIGHT onto BRIDGEWAY.	1.0 miles	Map
4:	Turn LEFT onto BRIDGE BLVD.	0.1 miles	Map
5:	Merge onto US-101 S toward SAN FRANCISCO (Portions toll).	7.3 miles	Map
6:	Turn RIGHT onto DIVISADERO ST.	1.0 miles	Map
7:	End at **Ucsf Mount Zion Medical Ctr** 415-885-7304 1600 Divisadero St # B218, San Francisco, CA 94115 US		Map

San Francisco Hotels **San Francisco Hotels**

Make this map interactive

Route Overview Map



Appendix C

Data Tables and Posting Maps from Army Phase II Remedial Investigation, ITSI, 2003

TABLE 1
BUILDING CLEANUP ACTIVITIES
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Room Number	Room Name	Floor Drain	Sumps	Pit	Floor Stain	White Powdery Material	Black Greasy Material	Misc. Debris *	Pressure Washed	Aboveground Storage Tank
103	Small Triaxial				Cleaned	Removed		Removed		
107	Drying Shrinkage	Cleaned						Removed	Yes	
111	Compaction				Cleaned			Removed		
113	Large Triaxial	Cleaned		Cleaned				Removed		
115	Soil Storage & Sampling				Cleaned					
117	Soil Storage & Sampling				Cleaned					
130	Cyclic Triaxial				Cleaned					
131	Compressor Room						Removed	Removed		
132	Boiler Room									Triple Rinsed (500 gal.)
133	Triaxial Room				Cleaned			Removed		
134	Durability Testing					Removed				
135	Concrete Hot Room	Cleaned						Removed	Yes	
137	Concrete Curing Room	Cleaned						Removed	Yes	
138	Freeze Thaw Room				Cleaned			Removed		
139	TY Lab				Cleaned			Removed		
140	Freeze Thaw Room				Cleaned			Removed		
141	Heating & Drying				Cleaned					
142	Compression Room	Cleaned						Removed	Yes	
143	Heating & Drying		Cleaned	Cleaned	Cleaned					
144	Machine Shop				Cleaned					
160	Concrete Laboratory		Cleaned							
162	Drying Shrinkage	Cleaned						Removed	Yes	
166	Cold Room	Cleaned						Removed	Yes	
168	Concrete Curing Room	Cleaned						Removed	Yes	
170	Concrete Laboratory		Cleaned		Cleaned	Removed		Removed		
216	Mezzanine									Removed & Disposed
NA	Chemical Storage Bldg.							Removed	Yes	
NA	Holding Tank NW of Room 107		Cleaned **						Yes	

Notes:

* Debris were placed in a central accumulation area in front of Room 137

** Solids (sand & gravel) were partially removed. Remaining solids to be removed during holding tank removal activities.

TABLE 2
ORGANIC COMPOUNDS DETECTED IN SOIL (ug/kg)
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Boring	Depth (feet)	Sample Name	TEPH	Acetone	MEK (2-Butanone)	Benzo(b+k) Fluoranthene	Bis-(2-Ethlylhexyl Phthalate	Anthracene	Pyrene	Fluoranthene
Analytical Method (EPA)			8015	8260B	8260B	8270	8270	8270	8270	8270
SB10	4.5	SB10S1-4.5	12,000	ND (52)	ND (10)	ND (350)	ND (350)	ND (350)	ND (350)	ND (350)
SB10	4.5 (dup)	SB10S3-4.5	NA	ND (50)	ND (10)	NA	NA	NA	NA	NA
SB11	12.0	SB11S1-12.0	7,400	ND (57)	ND (11)	ND (380)	ND (410) UJ	ND (380)	ND (380)	ND (380)
SB12	10.0	SB12S1-10.0	6,200	ND (84)	ND (17)	ND (550)	ND (550)	ND (550)	ND (550)	ND (550)
SB12	10.0 (dup)	SB12S3-10.0	NA	ND (50)	ND (10)	NA	NA	NA	NA	NA
SB13	3.5	SB13S1-3.5	31,000	ND (63)	ND (13)	ND (410)	ND (410)	ND (410)	ND (410)	ND (410)
SB13	8.0	SB13S3-8.0	6,900	ND (63)	ND (13)	ND (500)	ND (500)	ND (500)	ND (500)	ND (500)
SB14	11.5	SB14S1-11.5	3,600	ND (55)	ND (11)	ND (360)	730	ND (360)	ND (360)	ND (360)
SB15	8.0	SB15S1-8	ND (5,700) U	150	19	ND (370)	ND (370)	ND (370)	ND (370)	ND (370)
SB15	11.5	SB15S3-11.5	ND (6,000) U	ND (60)	ND (12)	ND (400)	ND (400)	ND (400)	ND (400)	ND (400)
SB15	16.0	SB15S1-16.0	ND (6,100) U	ND (61)	ND (12)	ND (400)	ND (400)	ND (400)	ND (400)	ND (400)
SB16	4.5	SB16S1-4.5	ND (5,700) U	ND (57)	ND (11)	ND (380)	ND (380)	ND (380)	ND (380)	ND (380)
SB16	14.0	SB16S1-14.0	ND (6,300) U	ND (63)	ND (13)	ND (420)	ND (420)	ND (420)	ND (420)	ND (420)
SB17	4.0	SB17S1-4.0	ND (5,800) U	ND (58)	ND (12)	ND (390)	ND (390)	ND (390)	ND (390)	ND (390)
SB17	10.0	SB17S1-10.0	ND (5,800) U	ND (58)	ND (12)	ND (380)	ND (380) UJ	ND (380)	ND (380)	ND (380)
SB18	3.5	SB18S1-3.5	53,000	ND (56)	ND (11)	ND (370)	ND (370)	ND (370)	ND (370)	ND (370)
SB18	16.0	SB18S1-16.0	ND (6,100) U	ND (61)	ND (12)	ND (400)	ND (400)	ND (400)	ND (400)	ND (400)
SB19	6.0	SB19S1-6.0	470,000	170	33	**1,100 J**	ND (890) UJ	ND (890) UJ	930 J	990 J
SB19	18.0	SB19S1-18.0	2,500	ND (59)	ND (12)	ND (390)	ND (390)	ND (390)	ND (390)	ND (390)
SB19	18.0 (dup)	SB19S3-18.0	1,900	ND	ND	ND (380)	ND (380)	ND (380)	ND (380)	ND (380)
Screening Criteria:										
PRG		Residential	NE	1,600,000	NE	620*	NE	22,000,000	2,300,000	2,300,000
		Cal. Mod.	NE	NE	NE	NE	NE	NE	NE	NE
		Industrial	NE	6,200,000	NE	2,900*	NE	100,000,000	54,000,000	30,000,000

Notes:

* = as benzo(b)fluorathene

{**BOLD**} = Exceeds screening criteria.

Cal. Mod. = California Modified

Dup = Duplicate sample

J = Value estimated

MEK = Methyl ethyl ketone

ND = Not Detected (Detection Limit in Parenthesis)

NE = Not established

PRG = Preliminary Remediation Goals

TEPH = Total Extractable Petroleum Hydrocarbons (Diesel and Motor Oils)

U = Undetected, detection limit elevated due to blank contamination

ug/kg = Micrograms per kilogram

TABLE 2 (continued)
ORGANIC COMPOUNDS DETECTED IN SOIL (ug/kg)
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Boring	Depth (feet)	Sample Name	Anthracene	Benzo(a) anthracene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Benzo(g,h,i) perylene	Benzo(a) Pyrene	Chrysene	Dibenz(a,h) Anthracene	Fluoranthene	Indeno(1,2,3-cd) pyrene	Phenanthrene	Pyrene
Analytical Method (EPA)			8310	8310	8310	8310	8310	8310	8310	8310	8310	8310	8310	8310
SB10	4.5	SB10S1-4.5	ND (18)	ND (18)	ND (18)	ND (18)	ND (35)	ND (18)	ND (18)	ND (70)	ND (18)	ND (18)	18	ND (18)
SB10	4.5 (dup)	SB10S3-4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB11	12.0	SB11S1-12.0	ND (19)	ND (19)	ND (19)	ND (19)	ND (38)	ND (19)	ND (19)	ND (76)	ND (19)	ND (19)	ND (19)	ND (19)
SB12	10.0	SB12S1-10.0	ND (28)	ND (28)	ND (28)	ND (28)	ND (55)	ND (28)	ND (28)	ND (110)	ND (28)	ND (28)	ND (28)	ND (28)
SB12	10.0 (dup)	SB12S3-10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB13	3.5	SB13S1-3.5	86	190	160	62	94	**110**	140	**130**	570	75	280	440
SB13	8.0	SB13S3-8.0	ND (26)	ND (26)	ND (26)	ND (26)	ND (50)	ND (26)	ND (26)	ND (100)	ND (26)	ND (26)	ND (500)	ND (500)
SB14	11.5	SB14S1-11.5	ND (19)	ND (19)	ND (19)	ND (19)	ND (36)	ND (19)	ND (19)	ND (73)	ND (19)	ND (19)	ND (19)	ND (19)
SB15	8.0	SB15S1-8	ND (19)	ND (19)	ND (19)	ND (19)	ND (37)	ND (19)	ND (19)	ND (76)	ND (19)	ND (19)	ND (19)	ND (19)
SB15	11.5	SB15S3-11.5	ND (21)	ND (21)	ND (21)	ND (21)	ND (40)	ND (21)	ND (21)	ND (81)	ND (21)	ND (21)	ND (21)	ND (21)
SB15	16.0	SB15S1-16.0	ND (21)	ND (21)	ND (21)	ND (21)	ND (40)	ND (21)	ND (21)	ND (81)	ND (21)	ND (21)	ND (21)	ND (21)
SB16	4.5	SB16S1-4.5	ND (20)	ND (20)	ND (20)	ND (20)	ND (38)	ND (20)	ND (20)	ND (77)	ND (20)	ND (20)	ND (20)	ND (20)
SB16	14.0	SB16S1-14.0	ND (21)	ND (21)	ND (21)	ND (21)	ND (42)	ND (21)	ND (21)	ND (84)	ND (21)	ND (21)	ND (21)	ND (21)
SB17	4.0	SB17S1-4.0	ND (20)	ND (20)	ND (20)	ND (20)	ND (39)	ND (20)	ND (20)	ND (78)	ND (20)	ND (20)	ND (20)	ND (20)
SB17	10.0	SB17S1-10.0	ND (20)	ND (20)	ND (20)	ND (20)	ND (38)	ND (20)	ND (20)	ND (78)	ND (20)	ND (20)	ND (20)	ND (20)
SB18	3.5	SB18S1-3.5	ND (19)	ND (19)	24	ND (19)	ND (37)	19	ND (20)	ND (75)	30	25	35	27
SB18	16.0	SB18S1-16.0	ND (21)	ND (21)	ND (21)	ND (21)	ND (40)	ND (21)	ND (21)	ND (81)	ND (21)	ND (21)	ND (21)	ND (21)
SB19	6.0	SB19S1-6.0	ND (110,000)	170	190	ND (110,000)	ND (220,000)	ND (110)	270	ND (450)	210	140	190	230
SB19	18.0	SB19S1-18.0	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (39)	ND (20)	ND (78)	ND (20)	ND (20)	ND (20)	ND (20)
SB19	18.0 (dup)	SB19S3-18.0	ND (19)	ND (19)	ND (19)	ND (19)	ND (38)	ND (19)	ND (19)	ND (76)	ND (19)	ND (19)	ND (19)	ND (19)
Screening Criteria:														
PRG		Residential	22,000,000	620	620	6,200	NE	62	62,000	62	2,300,000	620	NE	2,300,000
		Cal. Mod.	NE	NE	NE	610	NE	NE	6,100	NE	NE	NE	NE	NE
		Industrial	100,000,000	2,900	2,900	29,000	NE	290	290,000	290	30,000,000	2,900	NE	54,000,000

Notes:

* = as benzo(b)fluorathene
{**BOLD**} = Exceeds screening criteria.
Cal. Mod. = California Modified
Dup = Duplicate sample
J = Value estimated
MEK = Methyl ethyl ketone
ND = Not Detected (Detection Limit in Parenthesis)
NE = Not established
PRG = Preliminary Remediation Goals
TEPH = Total Extractable Petroleum Hydrocarbons (Diesel and Motor Oils)
U = Undetected, detection limit elevated due to blank contamination
ug/kg = Micrograms per kilogram

TABLE 3
METALS DETECTED IN SOIL (mg/kg)
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Soil Boring	Depth	Sample Name	Arsenic	Barium	Beryllium	Cadmium	Total Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Vanadium	Zinc
SB10	4.5	SB10S1-4.5	**30**	110	0.47	ND (0.99)	80 J	15	37	24	0.12	95	ND (9.9)	ND (0.69)	55	50
SB11	12	SB11S1-12.0	ND (10)	100	0.43	ND (1.0)	35 J	11	23	19	0.074	36	ND (10)	ND (0.71)	37	50
SB12	10	SB12S1-10.0	ND (12) UJ	31	0.41	ND (1.6)	60 J	11 J	30	ND (12)	0.071 J	62 J	ND (16) UJ	ND (1.1) J	54	65
SB13	3.5	SB13S1-3.5	**14 J**	180	0.51	ND (1.1)	39 J	13 J	54	15	0.044 J	48 J	ND (11) UJ	ND (0.80) J	44	66
SB13	8	SB13S3-8.0	ND (15) UJ	36	0.28	ND (1.5)	43 J	9.6 J	22	ND (11)	0.074 J	52 J	ND (15) UJ	ND (1.1) J	39	50
SB14	11.5	SB14S1-11.5	ND (10)	74	0.045	ND (1.0)	23 J	9.1	17	ND (7.9)	0.02	27	ND (10)	ND (0.73)	35	49
SB15	8	SB15S1-8.0	ND (10)	130	0.24	ND (1.0)	12	8.1 J	9.7	ND (7.6)	0.025 J	13 J	ND (10) UJ	ND (0.71) UJ	21	14
SB15	16	SB15S1-16.0	ND (11)	360 J	0.47	ND (1.1)	41	7.2 J	20	ND (8.2)	0.11 J	39 J	ND (11) UJ	ND (0.76) UJ	36	36
SB15	11.5	SB15S3-11.5	ND (12)	220	0.42	ND (1.2)	32	9.8 J	23	ND (8.9)	0.05 J	31 J	ND (12) UJ	ND (0.89) UJ	42	26
SB16	4.5	SB16S1-4.5	ND (11)	220	0.52	ND (1.1)	37	11 J	26	ND (8.1)	0.069 J	46 J	ND (11) UJ	ND (0.76) UJ	45	34
SB16	14	SB16S1-14.0	ND (11)	320	0.63	ND (1.1)	42	12 J	39	ND (8.0)	0.14 J	52 J	ND (11) UJ	ND 0.75) UJ	75	40
SB17	4	SB17S1-4.0	ND (10)	200	0.47	ND (1.0)	28	17 J	28	ND (7.9)	0.029 J	40 J	ND (10) UJ	ND (0.73) UJ	43	43
SB17	10	SB17S1-10.0	ND (11)	310	0.52	ND (1.1)	30	17 J	33	ND (7.9)	0.034 J	44 J	ND (11) UJ	ND (0.74) UJ	52	53
SB18	3.5	SB18S1-3.5	ND (9.7)	180	0.3	ND (0.97)	19	6.7 J	31	25	1.8 J	20 J	ND (9.7) UJ	ND (0..68) UJ	29	36
SB18	16	SB18S1-16.0	ND (12)	200	0.48	ND (0.97)	36	7.8 J	31	ND (8.7)	0.063 J	40 J	ND (12) UJ	ND (0.81) UJ	54	39
SB19	6	SB19S1-6.0	ND (7.1)	320	0.65	ND (1.2)	38 J	16	34	ND (8.9)	0.65	55	ND (12)	ND (0.83)	63	55
SB19	18	SB19S1-18.0	ND (10)	250	0.62	ND (1.0)	62 J	16	32	ND (7.7)	0.022	50	ND (10)	ND (0.72)	63	47
SB19	18 (Dup)	SB19S3-18.0	ND (10)	250	0.53	ND (1.0)	37 J	16	24	ND (7.6)	0.032	41	ND (10)	ND (0.71)	49	44
Screening Criteria:																
PRGs		Residential	0.39	5,400	150	37	210	4,700	2,900	400	23	1,600	390	390	550	23,000
		Cal.- Mod.	NE	NE	NE	9	NE	NE	NE	NE	NE	150	NE	NE	NE	NE
		Industrial	2.7	100,000	2,200	810	450	100,000	76,000	750	610	41,000	10,000	10,000	14,000	100,000

Notes:
All samples analyzed by EPA Series Methods 6000/7000
{**Bold**} = Exceeds screening criteria
Cal. Mod. = California Modified
Dup = Duplicate sample
mg/kg = Milligrams per kilogram
ND = Not Detected (detection limit in parenthesis)
NE = Not Established
PRGs = Preliminary Remediation Goals

TABLE 4
ARSENIC CONCENTRATION RELATIVE TO PERCENT FINE-GRAINED SOIL FRACTION (mg/kg)
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Boring	Depth	Sieve Analysis (Percent Fines)	Arsenic (1) Concentration
SB-10	@ 4.5	16.83	13
SB-11	@ 12	13.68	8.1
SB-12	@ 10	20.51	**27**
SB-13	@ 3.5	36.13	11
SB-14	@ 11.5	15	9.3
SB-15	@ 8	*42.96*	9.2
SB-16	@ 4.5	*54.68*	5.8
SB-17	@ 4	*57.22*	9.4
SB-18	@ 3.5	25.31	7.7
SB-19	@ 6	*76.87*	11

Screening Criteria:			
Sediment Thresholds	SFESAC	(Less than 40 percent fines)	13.5
	SFESAC	(Less than 100 percent fines)	15.3
PRGs	Residential		0.39
	Industrial		2.7

Notes:
(1) All Sample Analyzed by Method 7060A
{**Bold**} = Exceeds screening criteria
{*Italic*} = Greater than 40 percent fines
mg/kg = Milligrams per kilogram
PRGs = Preliminary Remediation Goals
SFESAC = San Francisco Estuary Sediment Ambient Concentration

TABLE 5
GENERAL WATER QUALITY PARAMETERS (mg/l)
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Boring / Piezometer	Sample Name	Total Alkalinity	Bicarbonate Alkalinity	Chloride	Hardness as CaCo3	Sulfate as SO4	Total Dissolved Solids	pH	Specific Conductance (umho/cm)	Methylene Blue Active Substances
Analytical Method (EPA)		310.1	310.1	300	2340B	300	160.1	150.1	120.1	SM 5540C
SB11	SB11-W1	1,100	1,100	2,700	1,200	NA	NA	NA	6,300	0.028
SB12	SB12-W1	680	680	3,400	1,600	NA	NA	NA	10,000	0.17
SB12	SB12-W3	650	650	3,400	2,200	NA	NA	NA	10,000	0.15
SB13	SB13-W1	1,400	1,400	3,500	1,900	510	5,800	7	11,000	ND
SB14	SB14-W1	150	150	2,200	1,300	NA	NA	NA	6,500	ND
SB15	SB15-W1	220	220	180	1,600	NA	NA	NA	1,000	ND
SB15	SB15-W3	200	200	130	1,200	NA	NA	NA	1,300	0.11
Screening Criteria:										
Cal. MCL	Primary	NE	NE	NE	NE	NE	NE	NE	NE	NE
	Secondary	NE	NE	250K to 600K	NE	250K to 600K	NE	NE	NE	NE
	Action Level	NE	NE	250K to 600K	NE	250K to 600K	NE	NE	NE	NE
EPA MCL	Primary	NE	NE	NE	NE	NE	NE	NE	NE	NE
	Proposed	NE	NE	NE	NE	400-500	NE	NE	NE	NE
	Secondary	NE	NE	250	NE	250	500	6.5-8.5	NE	NE

Notes:

Cal. = California
EPA = Environmental Protection Agency
K = One thousand
MCL = Maximum Contaminant Levels
mg/l = Milligrams per liter
NA =Not Analyzed
ND = Not Detected
NE = Not Established

TABLE 6
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER (ug/l)
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Boring / Piezometer	Sample Name	TEPH	Toluene	Xylenes	PCP
Analytical Method (EPA)		8015	8260	8260	515.1
SB-11	SB11-W1	ND (200) UJ	1.5	ND (2.0)	ND (0.2)
SB-12	SB12-W1	490	ND (1.0)	ND (2.0)	0.084J
SB-12 (Dup)	SB12-W3	730	ND (1.0)	ND (2.0)	0.056J
SB-13	SB13-W1	340	ND (1.0)	ND (2.0)	ND (0.2)
SB-14	SB14-W1	ND (130) UJ	2.5	2.2	ND (0.2)
SB-15	SB15-W1	380	2.5	2.0	ND (0.2) UJ
SB-15 (Dup)	SB15-W3	300	1.8	ND (2.0)	ND (0.2) UJ
Trip Blank	TB112901	NA	NA	NA	NA
Screening Criteria:					
California MCL	Primary	NE	150	1,750	1
	Secondary	NE	NE	NE	NE
	Action Level	NE	NE	NE	NE
EPA MCL	Primary	NE	1,000	10,000	1
	Proposed	NE	40	20	NE
	Secondary	NE	NE	NE	NE

Notes:
Dup = Duplicate Sample
EPA = Environmental Protection Agency
J = Value Estimated
MCL = Maximum Contaminant Levels
NA =Not Analyzed
ND = Not Detected (Detection Limit in Parenthesis)
NE = Not Established
PCP = Pentachlorophenol
TEPH = Total Extractable Petroleum Hydrocarbons (Diesel and Motor Oils)
ug/l = Micrograms per liter
UJ = Not Detected, detection limit estimated

TABLE 7
DISSOLVED METALS DETECTED IN GROUNDWATER (ug/l)
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Boring / Piezometer	Sample Name	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Thallium	Vanadium	Zinc
SB11	SB11-W1	ND (60)	**110**	**3,100 J**	**5.2**	ND (10)	**590**	98	320	**100**	0.37 J	22 J	**410**	ND (100) UJ	ND (100) UJ	580	540
SB12	SB12-W1	ND (60) R	ND (100)	**1,700**	1.3	ND (10)	**82**	40	110	ND (75)	ND (0.20) UJ	ND (20)	94	ND (100) R	ND (100)	130	180
SB12 (dup)	SB12-W3	ND (60) R	**240**	**7,500**	**15**	ND (10)	**910**	470	**1,300**	**900**	0.37 J	31	**1,000**	ND (100) R	**130**	1,500	2,000
SB13	SB13-W1	ND (60) R	ND (100)	**2,000**	2.7	ND (10)	**190**	62	190	ND (75)	0.78 J	ND (20)	**210**	ND (100) R	ND (100)	290	260
SB14	SB14-W1	ND (60)	**390**	**9,500 J**	**36**	**14**	**1,500**	910	**1,700**	**480**	1.0 J	42 J	**2,200**	ND (100)	**170 J**	3,000	3,000
SB15	SB15-W1	ND (60) R	**190**	**19,000**	**26**	ND (10)	**1,600**	670	**1,600**	**390**	0.79 J	24 J	**1,800**	ND (100) R	**220 J**	2,000	2,000
SB15 (dup)	SB15-W3	ND (60) R	**140**	**12,000**	**19**	ND (10)	**990**	490	**1,000**	**220**	0.67 J	ND (20) UJ	**1,200**	ND (100) R	**180 J**	1,300	1,300
Screening Criteria:																	
California MCL	Primary	6	50	1,000	4	5	50	NE	NE	NE	2	NE	100	50	2	NE	NE
	Secondary	NE	NE	NE	NE	NE	NE	NE	1,000	NE	NE	NE	NE	NE	NE	NE	5,000
	Action Level	NE	NE	NE	NE	NE	NE	NE	1,300	15	NE	NE	NE	NE	NE	NE	NE
EPA MCL	Primary	6	50	2,000	4	5	100	NE	NE	NE	2	NE	NE	50	2	NE	NE
	Secondary	NE	NE	NE	NE	NE	NE	NE	1,000	NE	NE	NE	NE	NE	NE	NE	5,000
	Action Level	NE	NE	NE	NE	NE	NE	NE	1,300	15	NE	NE	NE	NE	NE	NE	NE

Notes:
All samples analyzed by EPA Method 6000/7000.
{**Bold**} = Exceeds screening criteria
EPA = Environmental Protection Agency
J = Value estimated
MCL = Maximum Contaminant Levels
NA = Not Analyzed
ND = Not Detected (Detection Limit in Parenthesis)
NE = Not established
R = Rejected, data not considered valid.
ug/l = Micrograms per liter
UJ = Undetected at an estimated detection limit

TABLE 8
GORESORBER SCREENING RESULTS (ug)
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Soil Boring	Sample Name	c12-DCE	11-DCA	111-TCA	12-DCA	TCE	PCE	11-DCE	$CHCl_3$	CCl_4	112-TCA	1122-TetCA
SB-10	176980	ND	ND	**0.03**	ND	**0.08**	BDL	ND	**0.44**	**0.51**	ND	BDL
SB-12	176311	ND	BDL	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB-13	176310	ND	ND	ND	ND	ND	ND	BDL	ND	ND	ND	ND
SB-15	176978	ND	ND	ND	ND	ND	**0.04**	BDL	**0.11**	ND	ND	ND
SB-16	176979	ND	BDL	ND	ND	ND	ND	BDL	ND	ND	ND	BDL
SB-17	176977	**0.06**	**0.04**	BDL	BDL	**0.03**	BDL	**0.21**	**1.79**	**0.65**	**0.14**	**0.4**
SB-18	176976	ND	**0.03**	ND	**0.01**	ND	ND	**0.12**	ND	ND	BDL	ND
SB-19	176981	ND	ND	ND	ND	ND	ND	BDL	**0.3**	ND	ND	ND
Method Detection Limit		*0.02*	*0.02*	*0.03*	*0.01*	*0.03*	*0.03*	*0.06*	*0.02*	*0.03*	*0.07*	*0.02*

Notes:

11-DCA = 1,1-Dichloroethane

11-DCE = 1,1-Dichloroethene

111-TCA = 1,1,1-Trichloroethane

12-DCA = 1,2-Dichloroethane

112-TCA = 1,1,2-Trichloroethane

1122-TetCA = 1,1,2,2-Tetrachloroethane

BDL = Below Detection Limit (detection limit estimated)

c12-DCE = cis-1,2-Dichloroethene

CCl_4 = Carbon Tetrachloride

$CHCl_3$ = Chloroform

ND = Not Detected

PCE = Tetrachloroethene

TCE = Trichloroethene

ug = Micrograms

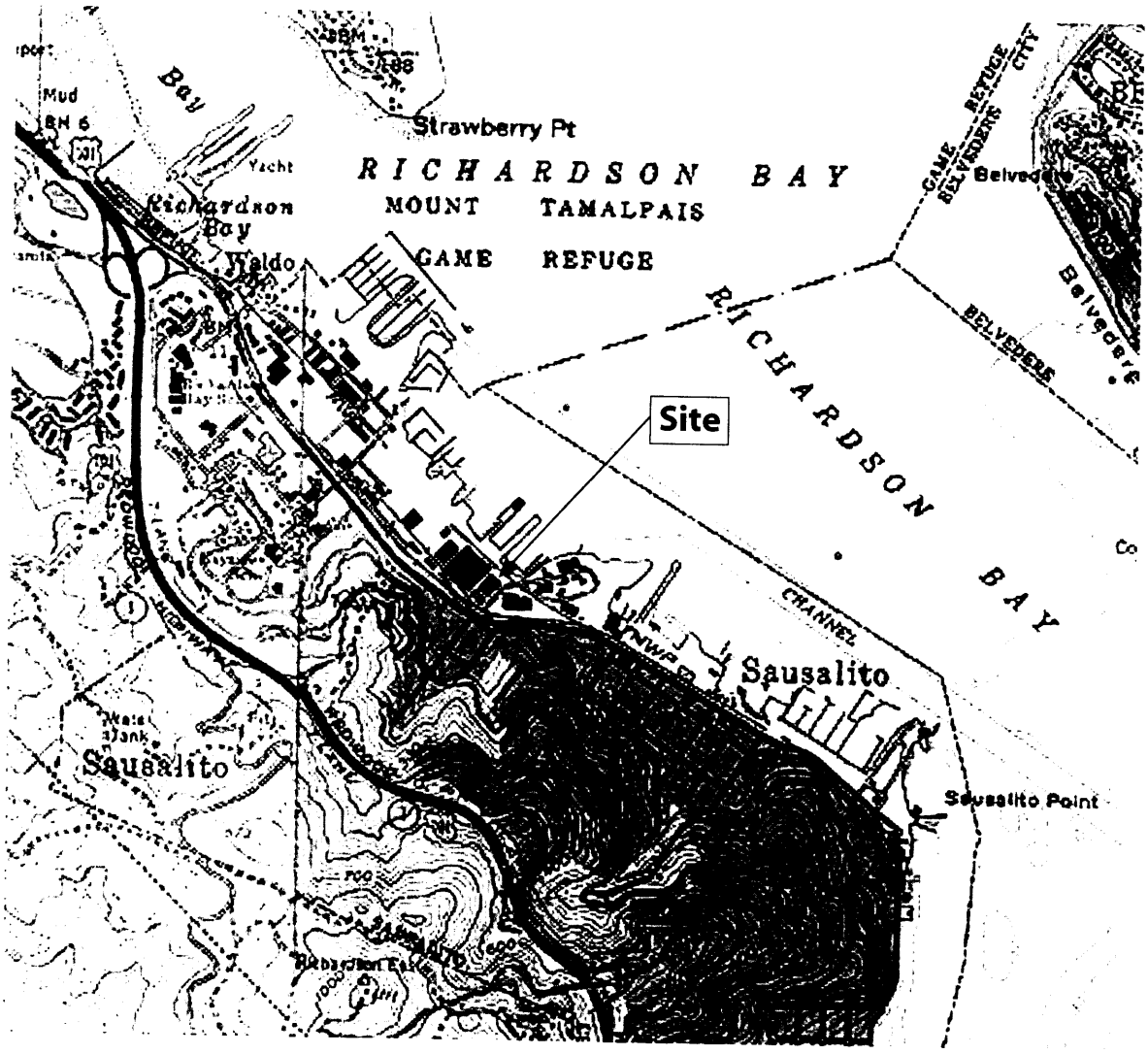
TABLE 9
PCBS DETECTED IN SOIL (mg/kg)
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Location	Depth (feet)	Sample Name	Date	Time	Ensys Reading	PCB Concentration (Ensys Screening)	PCB Concentration (Lab Confirmation)
BKG1	0.5	BKG1-0.5	12/10/2001	12:00	- 0.28	**> 0.5**	**0.95**
BKG1	1	BKG1-1	12/12/2001	9:43	+ 0.47	< 0.5	NA
BKG2	0.5	BKG2-0.5	12/10/2001	12:05	- 0.1	**> 0.5**	**1.6**
BKG2	1	BKG2-1	12/12/2001	9:40	+ 0.17	< 0.5	NA
BKG3	0.5	BKG3-0.5	12/10/2001	13:00	+ 0.34	< 0.5	NA
BKG4	0.5	BKG4-0.5	12/11/2001	14:00	+ 0.90	< 0.5	NA
BKG5	0.5	BKG5-0.5	12/11/2001	14:05	+ 0.25	< 0.5	NA
BKG6	0.5	BKG6-0.5	12/12/2001	9:30	+ 0.54	< 0.5	NA
BKG6	1	BKG6-1	12/12/2001	9:35	+ 0.55	< 0.5	NA
BKG7	1	BKG7-1	12/12/2001	9:45	+ 0.49	< 0.5	NA
TP1	1	TP1-1	12/10/2001	11:40	- 0.46	**> 0.5**	**2.2**
TP1	3	TP1-3	12/10/2001	11:46	+ 1.64	< 0.5	NA
TP2	1.5	TP2-1.5	12/10/2001	11:15	+ 0.66	< 0.5	NA
TP2	3	TP2-3	12/10/2001	11:35	+ 0.18	< 0.5	NA
TP3	1	TP3-1	12/10/2001	15:05	+ 0.40	< 0.5	NA
TP3 (Dup)	1	TP3-1-Dup	12/10/2001	15:05	+ 0.11	< 0.5	NA
TP3	3	TP3-3	12/10/2001	15:15	+ 0.39	< 0.5	0.038
TP4	1	TP4-1	12/10/2001	15:20	+ 0.28	< 0.5	**0.39**
TP4	3	TP4-3	12/10/2001	15:30	+ 0.20	< 0.5	NA
TP4 (Dup)	3	TP4-3-Dup	12/10/2001	15:30	+ 0.31	< 0.5	NA
TP5	1	TP5-1	12/10/2001	14:40	- 0.25	**> 0.5**	NA
TP5	3	TP5-3	12/10/2001	14:45	- 0.27	**> 0.5**	NA
TP6	1	TP6-1	12/10/2001	14:30	+ 0.31	< 0.5	NA
TP6	3	TP6-3	12/10/2001	14:35	- 0.14	**> 0.5**	NA
TP7	1	TP7-1	12/10/2001	13:05	+ 0.07	< 0.5	NA
TP7	3	TP7-3	12/10/2001	13:10	- 0.37	**> 0.5**	NA
TP8	1	TP8-1	12/10/2001	13:20	- 0.36	**> 0.5**	NA
TP8	3	TP8-3	12/10/2001	13:30	- 0.23	**> 0.5**	NA
TP9	1.5	TP9-1.5	12/11/2001	10:35	- 0.23	**> 0.5**	**2.4**
TP9 (Dup)	1.5	TP9-1.5-Dup	12/11/2001	10:35	- 0.16	**> 0.5**	**10.1**
TP9	3	TP9-3	12/11/2001	10:55	+ 0.03	< 0.5	NA

TABLE 9 (continued)
PCBS DETECTED IN SOIL (mg/kg)
PHASE II REMEDIAL INVESTIGATION
USACE SOUTHERN PACIFIC DIVISION LABORATORY
SAUSALITO, CALIFORNIA

Location	Depth (feet)	Sample Name	Date	Time	Ensys Reading	PCB Concentration (Ensys Screening)	PCB Concentration (Lab Confirmation)
TP10	1	TP10-1	12/11/2001	11:00	+ 0.70	< 0.5	ND (0.036)
TP10	3	TP10-3	12/11/2001	11:25	+ 0.59	< 0.5	ND (0.036)
TP11	1	TP11-1	12/11/2001	13:30	+ 0.56	< 0.5	ND (0.039)
TP11	3	TP11-3	12/11/2001	13:40	+ 0.66	< 0.5	ND (0.039)
TP12	1	TP12-1	12/11/2001	13:00	+ 0.88	< 0.5	NA
TP12	2.5	TP12-2.5	12/11/2001	13:10	+ 0.24	< 0.5	NA
TP12	3	TP12-3	12/11/2001	13:15	+ 0.84	< 0.5	NA
TP13	1	TP13-1	12/12/2001	9:15	+ 0.52	< 0.5	0.04
TP13	3	TP13-3	12/12/2001	9:20	+ 1.08	< 0.5	ND (0.036)
BLANK	NA	BLANK	12/10/2001	12:45	+ 0.45	< 0.5	NA
Screening Criteria:							
PRG		Residential				0.22	0.22
		Industrial				1	1

Notes:
{**BOLD**} = Exceeds screening criteria.
mg/kg = Milligrams per kilograms
NA = Not Analyzed
ND = Not Detected (Detection Limit in Parenthesis)
PCBs = Polychlorinated Biphenyls
PRG = Preliminary Remediation Goal



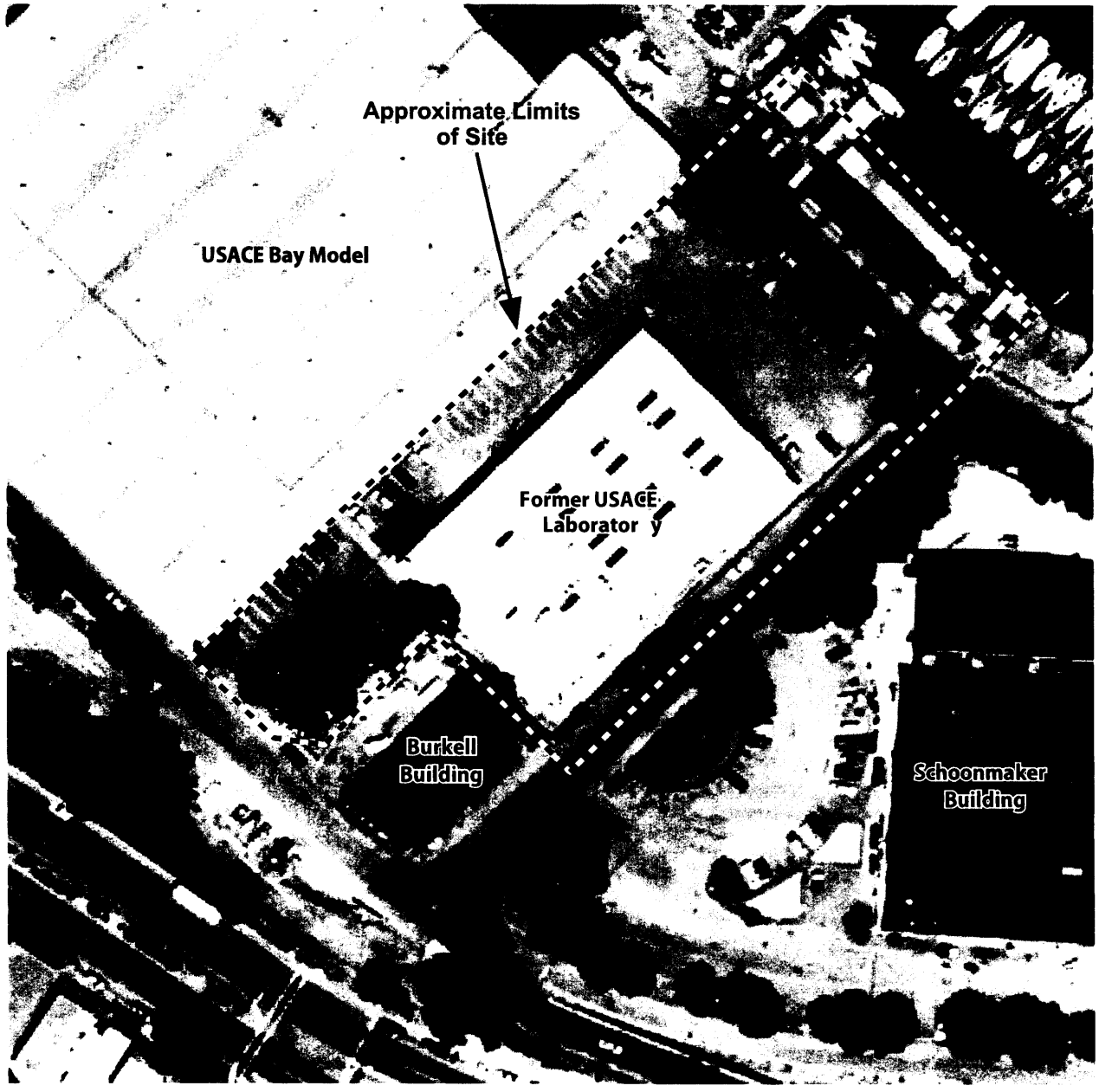
0 2,000 Feet 4,000 Feet

Approximate Scale

Source: U.S. Geological Survey topographics maps for Point Bonita and South San Francisco North quadrangles

ITSI Innovative Technical Solutions, Inc.	**US Army Corps of Engineers** South Pacific Division Laboratory Sausalito, California	**FIGURE 1** Site Location

Public\Projects\2000\00-125 SPD\Graphics\Fig 1 Site Location.ai



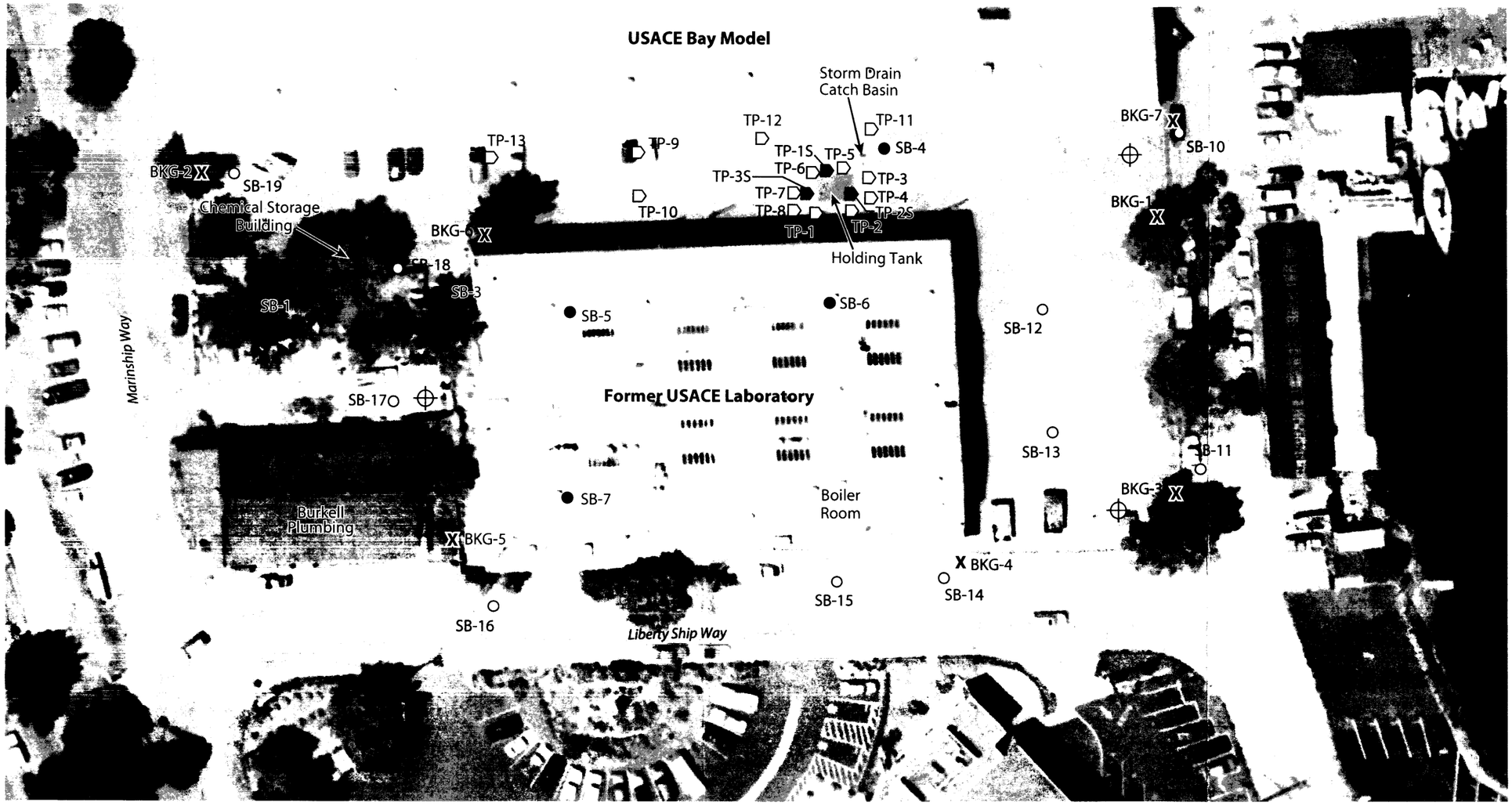
0 100 Feet 200 Feet

Approximate Scale

Source: Historical Aerial Photograph from August 14, 1995, Flight Number AV-4890-20-55, Pacific Aerial Surveys

ITSI Innovative Technical Solutions, Inc.	**US Army Corps of Engineers** South Pacific Division Laboratory Sausalito, California	**FIGURE 2** Site Layout

Public\Projects\2000\00-125 SPD\Graphics\Fig 2 Site Layout.ai



LEGEND

- ● 1999 Soil Boring Locations
- ▶ 1999 Test Pit Locations
- ○ 2001 Soil Boring Locations
- ▷ 2001 Test Pit Locations
- X 2001 Background Soil Sample Locations
- ⊕ Proposed Groundwater Monitoring Well Locations

Source: Historical Aerial Photograph, May 3, 2000, Flight Number AV-6540-126-63, Pacific Aerial Surveys

Public\Projects\2000\00-125\Graphics\Fig 3 Boring Locations.ai

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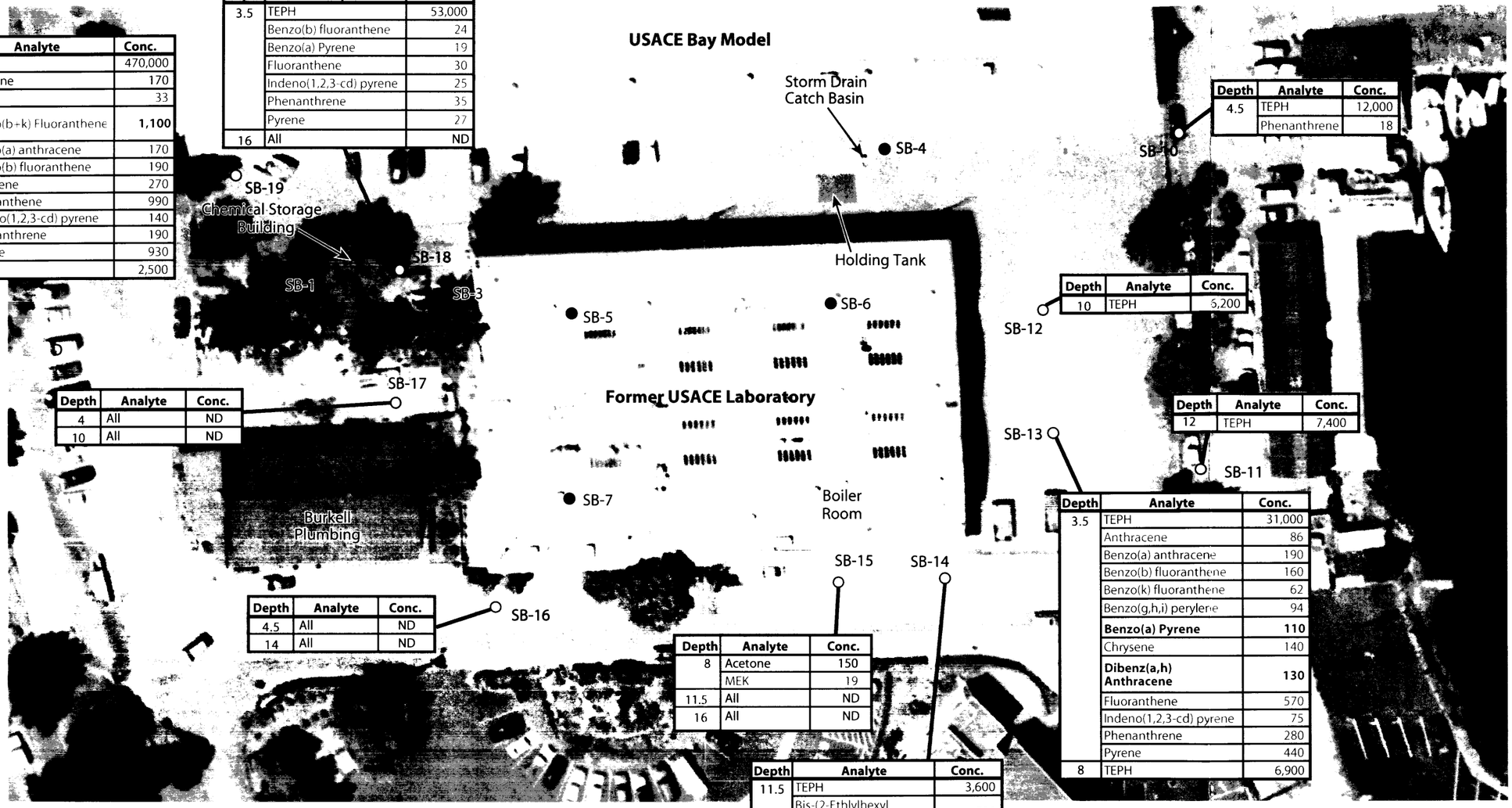
Figure 3
Sample Locations



Depth	Analyte	Conc.
6	TEPH	470,000
	Acetone	170
	MEK	33
	Benzo(b+k) Fluoranthene	**1,100**
	Benzo(a) anthracene	170
	Benzo(b) fluoranthene	190
	Chrysene	270
	Fluoranthene	990
	Indeno(1,2,3-cd) pyrene	140
	Phenanthrene	190
	Pyrene	930
18	TEPH	2,500

Depth	Analyte	Conc.
3.5	TEPH	53,000
	Benzo(b) fluoranthene	24
	Benzo(a) Pyrene	19
	Fluoranthene	30
	Indeno(1,2,3-cd) pyrene	25
	Phenanthrene	35
	Pyrene	27
16	All	ND

Depth	Analyte	Conc.
4	All	ND
10	All	ND

Depth	Analyte	Conc.
4.5	All	ND
14	All	ND

Depth	Analyte	Conc.
8	Acetone	150
	MEK	19
11.5	All	ND
16	All	ND

Depth	Analyte	Conc.
11.5	TEPH	3,600
	Bis-(2-Ethlylhexyl Phthalate	730

Depth	Analyte	Conc.
4.5	TEPH	12,000
	Phenanthrene	18

Depth	Analyte	Conc.
10	TEPH	5,200

Depth	Analyte	Conc.
12	TEPH	7,400

Depth	Analyte	Conc.
3.5	TEPH	31,000
	Anthracene	86
	Benzo(a) anthracene	190
	Benzo(b) fluoranthene	160
	Benzo(k) fluoranthene	62
	Benzo(g,h,i) perylene	94
	Benzo(a) Pyrene	**110**
	Chrysene	140
	Dibenz(a,h) Anthracene	**130**
	Fluoranthene	570
	Indeno(1,2,3-cd) pyrene	75
	Phenanthrene	280
	Pyrene	440
8	TEPH	6,900

LEGEND

- ● 1999 Soil Boring Locations
- ○ 2001 Soil Boring Locations

Notes:

All Concentrations in Micrograms per Kilogram (mg/kg)

Bold - Concentration Exceeds Residential Preliminary Remediation Goal (PRG)

Conc. - Concentration

TEPH - Total Extractable Petroleum Hydrocarbons (Diesel and Motor Oils)

ND - Not Detected (Detection Limit in Parenthesis)

MEK - Methyl Ethyl Ketone

Red - Petroleum Hydrocarbons

Blue - Volatile Organics

Green - Semivolatile Organics

0 50 Feet 100 Feet

Approximate Scale

Source: Historical Aerial Photograph, May 3, 2000, Flight Number AV-6540-126-63, Pacific Aerial Surveys

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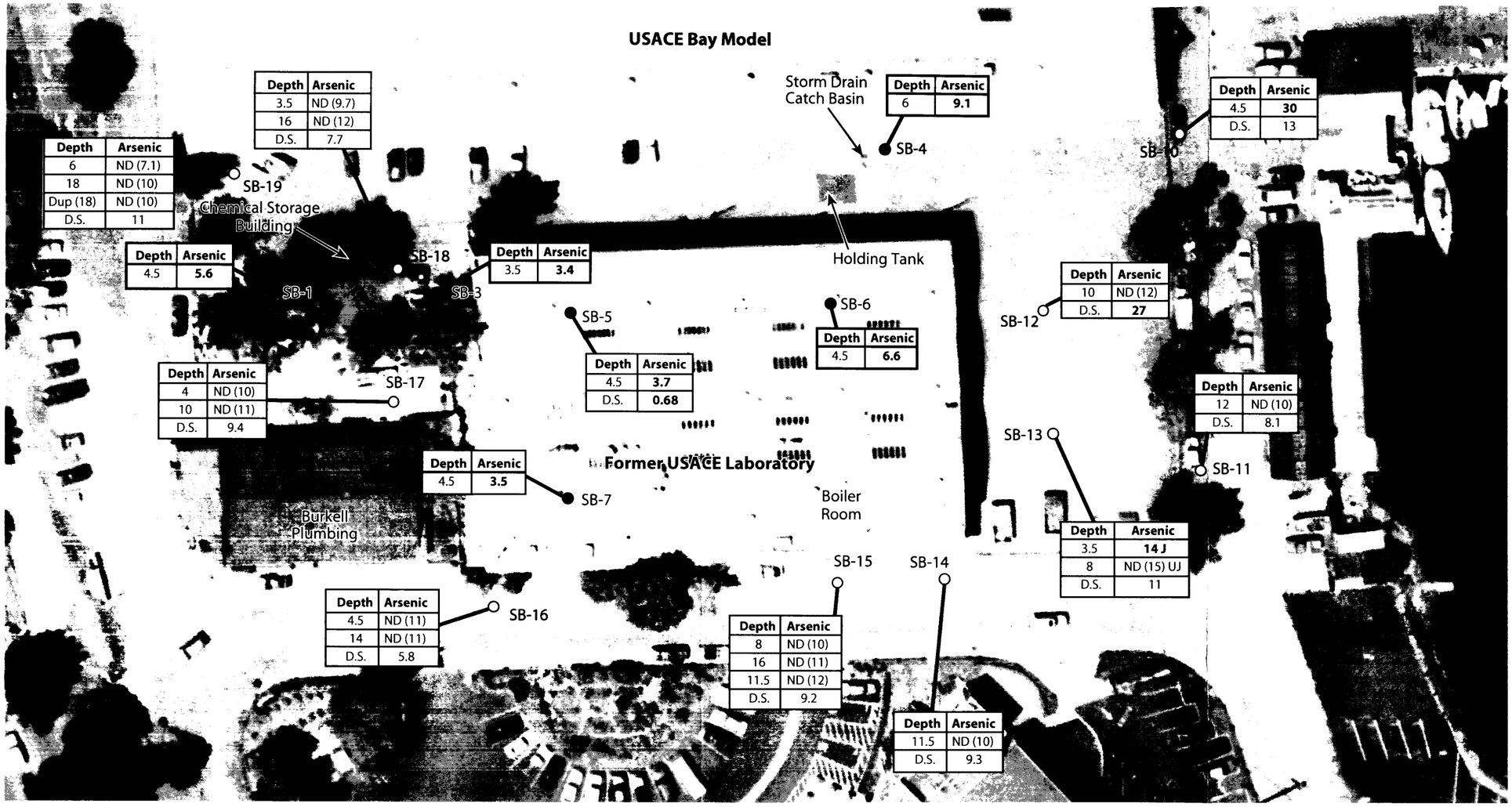
Figure 4
Organic Compounds Detected in Soil

Public\Projects\2000\00-125\Graphics\Fig 4 Org Compounds-v2.ai



Depth	Arsenic
6	ND (7.1)
18	ND (10)
Dup (18)	ND (10)
D.S.	11

Depth	Arsenic
3.5	ND (9.7)
16	ND (12)
D.S.	7.7

Depth	Arsenic
4.5	**5.6**

Depth	Arsenic
3.5	**3.4**

Depth	Arsenic
4	ND (10)
10	ND (11)
D.S.	9.4

Depth	Arsenic
4.5	**3.7**
D.S.	**0.68**

Depth	Arsenic
4.5	**6.6**

Depth	Arsenic
4.5	**3.5**

Depth	Arsenic
4.5	ND (11)
14	ND (11)
D.S.	5.8

Depth	Arsenic
8	ND (10)
16	ND (11)
11.5	ND (12)
D.S.	9.2

Depth	Arsenic
11.5	ND (10)
D.S.	9.3

Depth	Arsenic
3.5	**14 J**
8	ND (15) UJ
D.S.	11

Depth	Arsenic
6	**9.1**

Depth	Arsenic
4.5	**30**
D.S.	13

Depth	Arsenic
10	ND (12)
D.S.	**27**

Depth	Arsenic
12	ND (10)
D.S.	8.1

LEGEND

- ● 1999 Soil Boring Locations
- ○ 2001 Soil Boring Locations

Notes:

All Concentrations in Milligrams per Kilogram (mg/kg)
Bold - Concentration Exceeds Preliminary Remediation Goal (PRG)
D.S. - Duplicate Shallow Sample for Comparison to SFESAC (**Bold** Indicates Concentration Exceeds SFESAC)
Dup - Duplicate Soil Sample (Depth in Parenthesis)
J - Estimated Value
ND - Not Detected (Detection Limit in Parenthesis)
UJ - Undetected at an estimated detection limit

0 50 Feet 100 Feet
Approximate Scale

Source: Historical Aerial Photograph, May 3, 2000, Flight Number AV-6540-126-63, Pacific Aerial Surveys

Public\Projects\2000\00-125\Graphics\Fig 5 Metal Concentrations.ai

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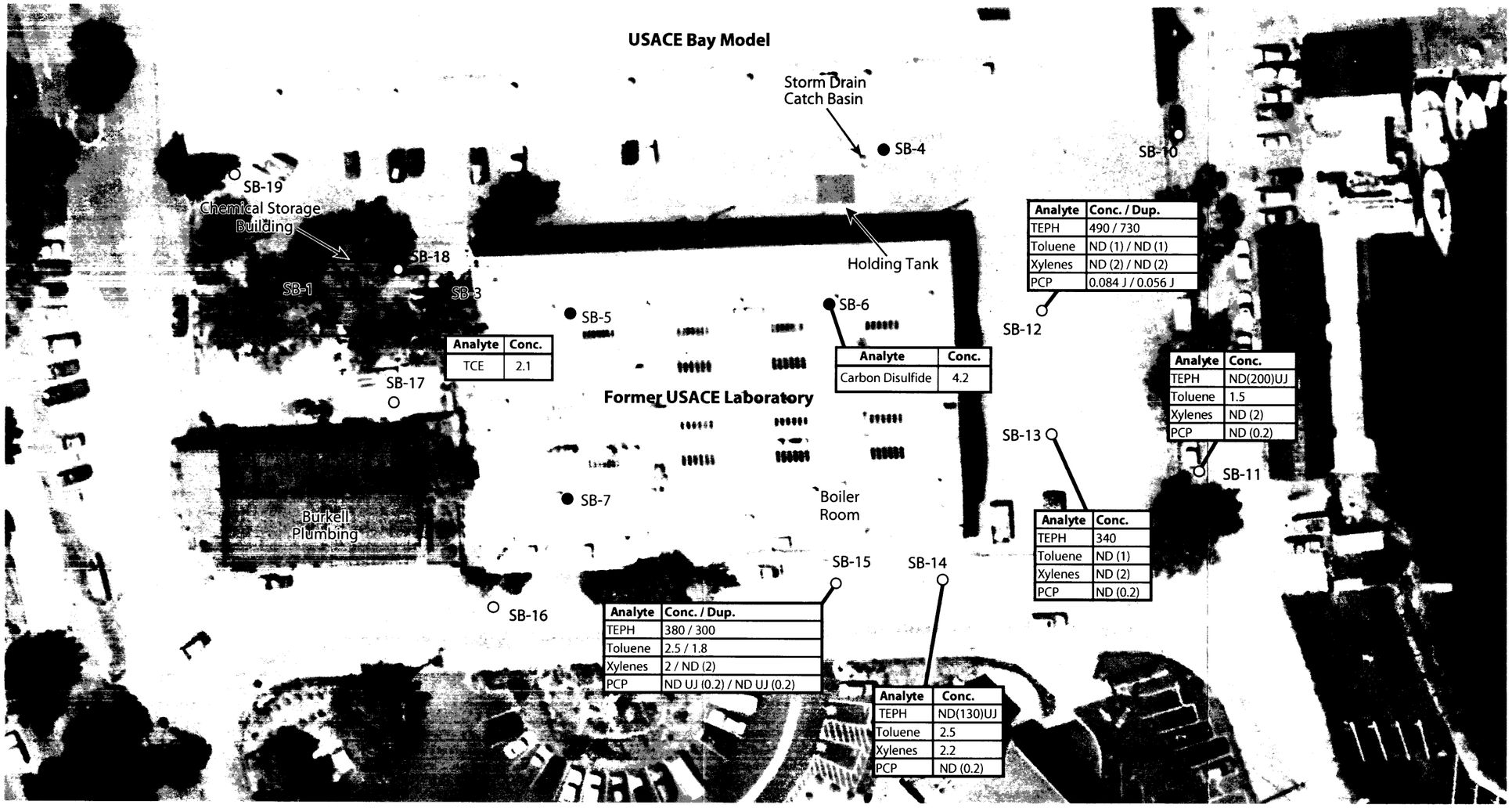
Figure 5
Arsenic Concentrations in Soil



LEGEND

- ● 1999 Soil Boring Locations
- ○ 2001 Soil Boring Locations

Notes:

All concentrations in Micrograms per Liter (mg/L)
Dup - Duplicate Sample Concentration
J - Value Estimated
ND - Not Detected (Detection Limit in Parenthesis)
PCP - Pentachlorophenol
TEPH - Total Extractable Petroleum Hydrocarbons (Diesel and Motor Oils)
TCE - Tetrachloroethene
UJ - Not Detected, Detection Limit Estimated

0 50 Feet 100 Feet
Approximate Scale

Source: Historical Aerial Photograph, May 3, 2000, Flight Number AV-6540-126-63, Pacific Aerial Surveys

Public\Projects\2000\00-125\Graphics\Fig 6 Org Compounds in GW.ai

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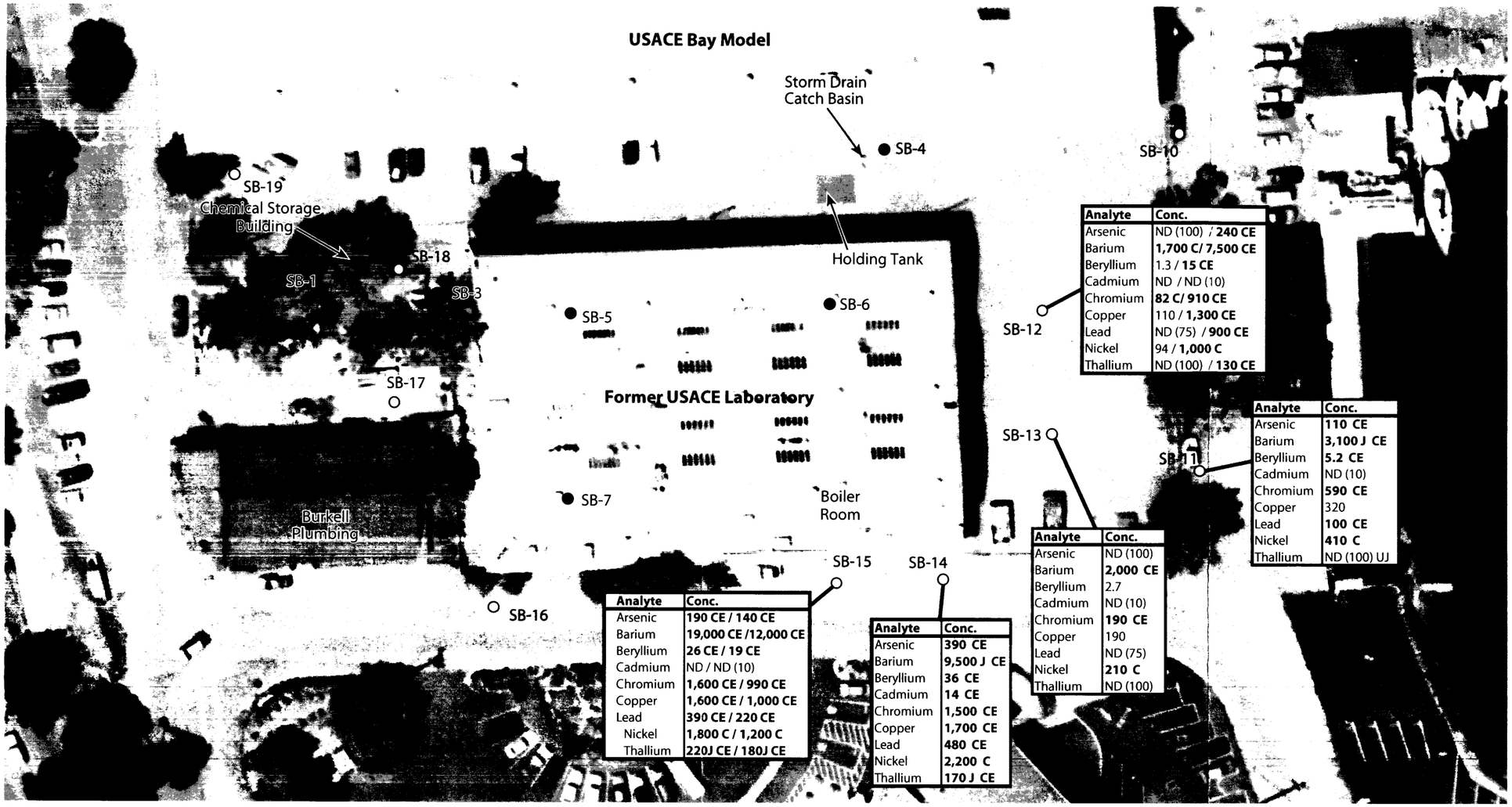
Figure 6
Organic Compounds Detected in Groundwater



LEGEND

- ● 1999 Soil Boring Locations
- ○ 2001 Soil Boring Locations

Notes:

All concentrations in Micrograms per Liter (mg/L)
Bold - Concentration Exceeds Maximum Contamination Level (MCL)
US EPA - United States Evnironmental Protection Agency
ND - Not Detected (Detection Limit in Parenthesis)
J - Value Estimated
UJ - Undetected at an estimated detection limit

C - California MCL
CE - EPA MCL

0 50 Feet 100 Feet
Approximate Scale

Source: Historical Aerial Photograph, May 3, 2000, Flight Number AV-6540-126-63, Pacific Aerial Surveys

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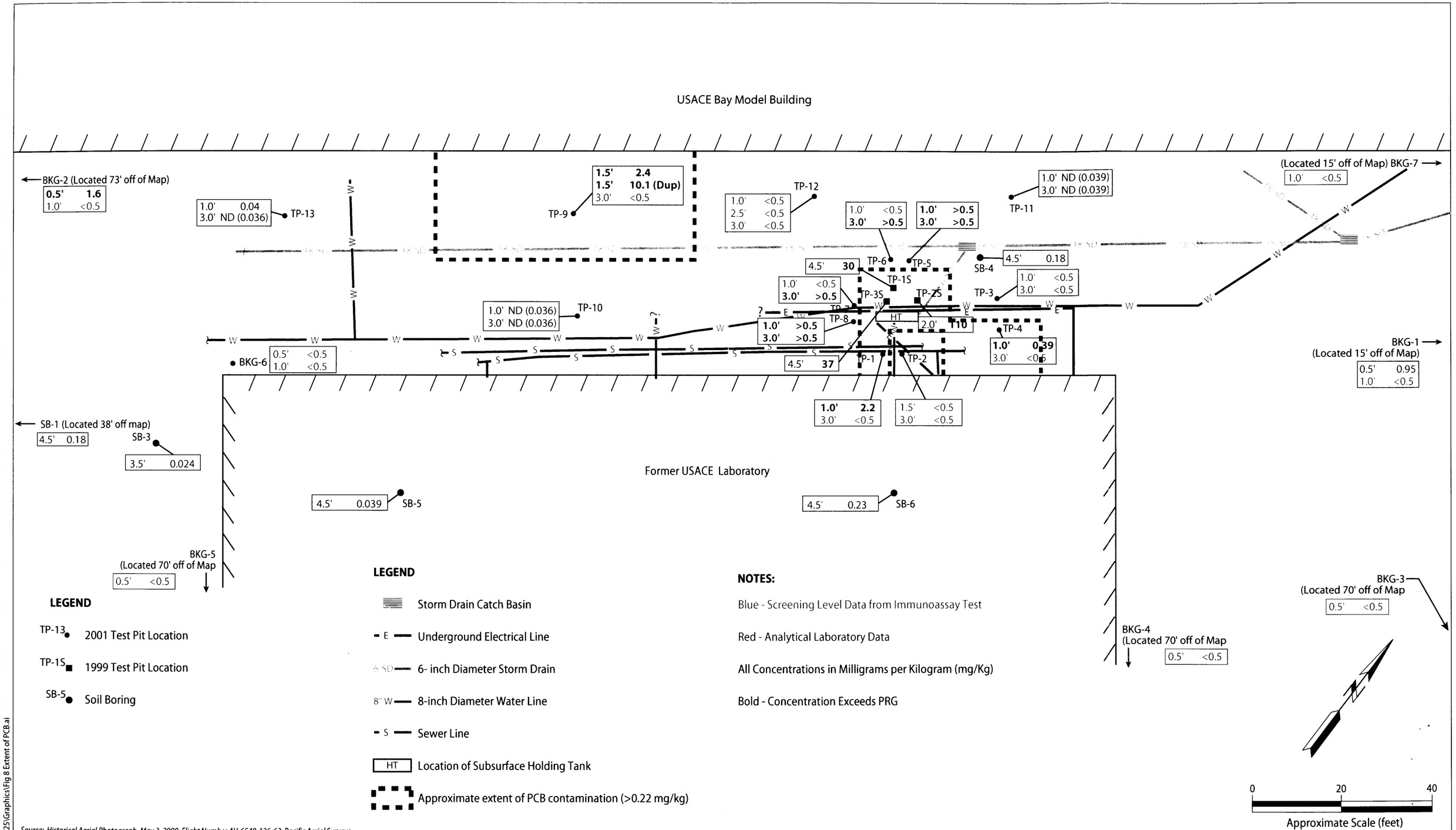
South Pacific Division Laboratory
Sausalito, California

Figure 7
Dissolved Metal Concentrations in Groundwater Exceeding Screening Criteria

Public\Projects\2000\00-125\Graphics\Fig 7 Metal Concs in GW.ai



LEGEND

- TP-13 ● 2001 Test Pit Location
- TP-1S ■ 1999 Test Pit Location
- SB-5 ● Soil Boring

LEGEND

- Storm Drain Catch Basin
- E — Underground Electrical Line
- 6" SD — 6- inch Diameter Storm Drain
- 8" W — 8-inch Diameter Water Line
- S — Sewer Line
- HT — Location of Subsurface Holding Tank
- Approximate extent of PCB contamination (>0.22 mg/kg)

NOTES:

Blue - Screening Level Data from Immunoassay Test

Red - Analytical Laboratory Data

All Concentrations in Milligrams per Kilogram (mg/Kg)

Bold - Concentration Exceeds PRG

Source: Historical Aerial Photograph, May 3, 2000, Flight Number AV-6540-126-63, Pacific Aerial Surveys

Public\Projects\2000\00-125\Graphics\Fig 8 Extent of PCB.ai

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South Pacific Division Laboratory
Sausalito, California

Figure 8
Extent of PCBs in Soil (mg/Kg)

Appendix D

Data Tables and Posting Maps from the Preliminary Environmental Assessment, ITSI, 1998

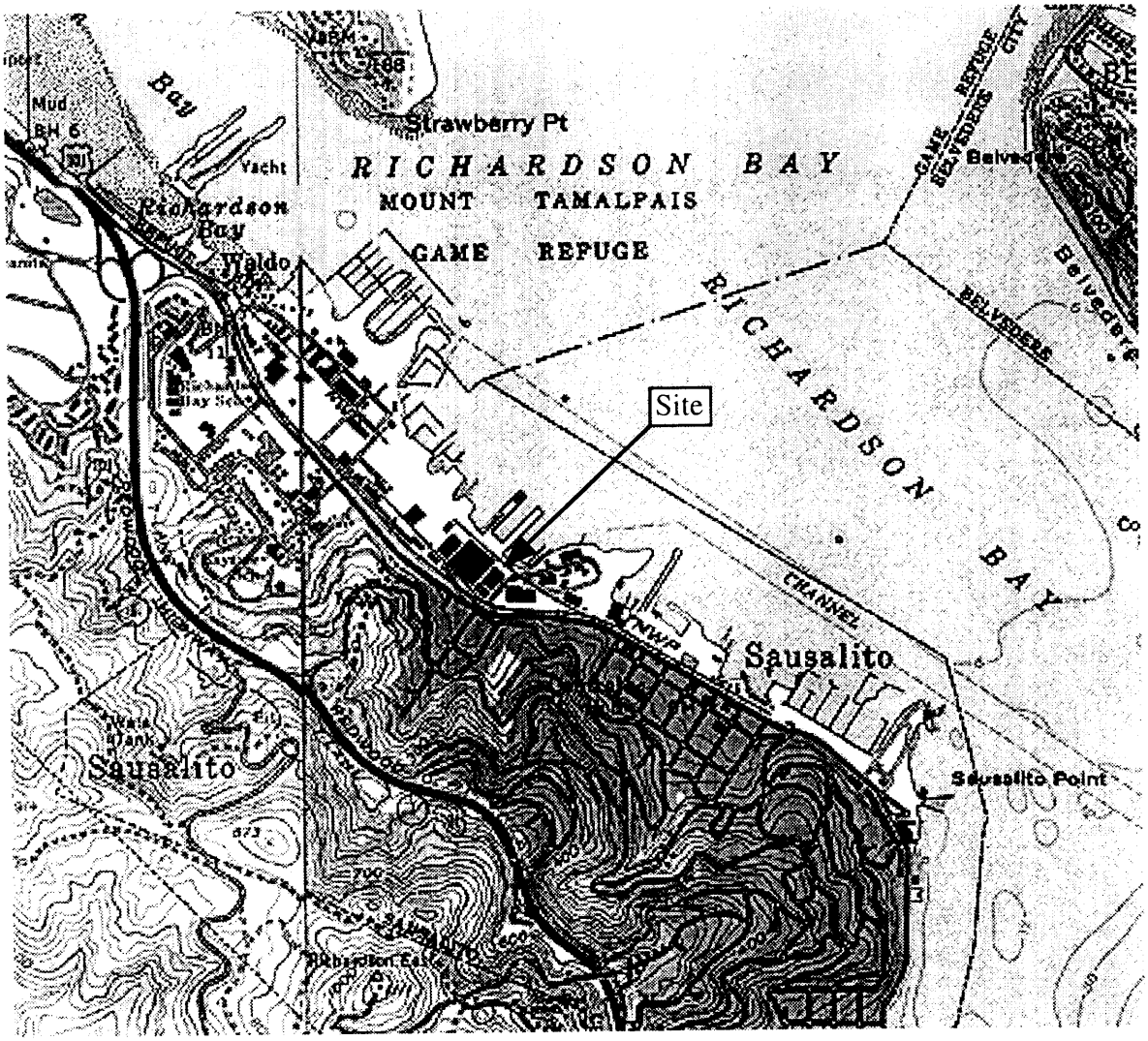
TABLE 1

REVIEW OF HISTORICAL AERIAL PHOTOGRAPHS[1]
USACE SOUTH PACIFIC DIVISION LABORATORY
SAUSALITO, CA

Date	Flight & Frame No.	Scale	Stereo?	Observations
10/28/46	AV 9-5-2/3 GS/CP	1:23,600	Yes	USACE Building, adjacent Paint Shop and 3 sheds are present on the project site
05/09/50	AV 32-03-04/05	1:7,200	Yes	No significant changes to buildings or surrounding area
03/01/58	SF-AREA	1:36,000	Yes	No significant changes to buildings or surrounding area
07/09/63	AV 550-03-19/20	1:36,000	Yes	Ship ways have been removed. Changes to the roof of the Paint Shop
06/12/70	AV-957-07-24/25	1:12,000	Yes	No significant changes to buildings or surrounding area
04/28/75	AV 1187-07-27/28	1:12,000	Yes	No significant changes to buildings or surrounding area
03/12/80	AV 1840-07-25/26	1:12,000	Yes	No significant changes to buildings or surrounding area
04/19/82	AV 2140-07-26/27	1:12,000	Yes	No significant changes to buildings or surrounding area
04/19/86	AV 2860-14-29/30	1:12,000	Yes	No significant changes to buildings or surrounding area
03/15/90	AV 3766-12-29/30	1:12,000	Yes	Laboratory building painted gray
04/27/92	AV 4252-0231-50/51	1:12,000	Yes	No significant changes to buildings or surrounding area
08/14/95	AV 4890-20-54/55	1:12,000	Yes	Trees obscure transformer pad and lab storage shed

[1] Historical aerial photographs obtained from Pacific Aerial Surveys.

98-111/F.1



0 2,000 Feet 4,000 Feet

Approximate Scale

Source: U.S. Geological Survey topographic maps for Point Bonita and San Francisco North quadrangles.

FIGURE 1

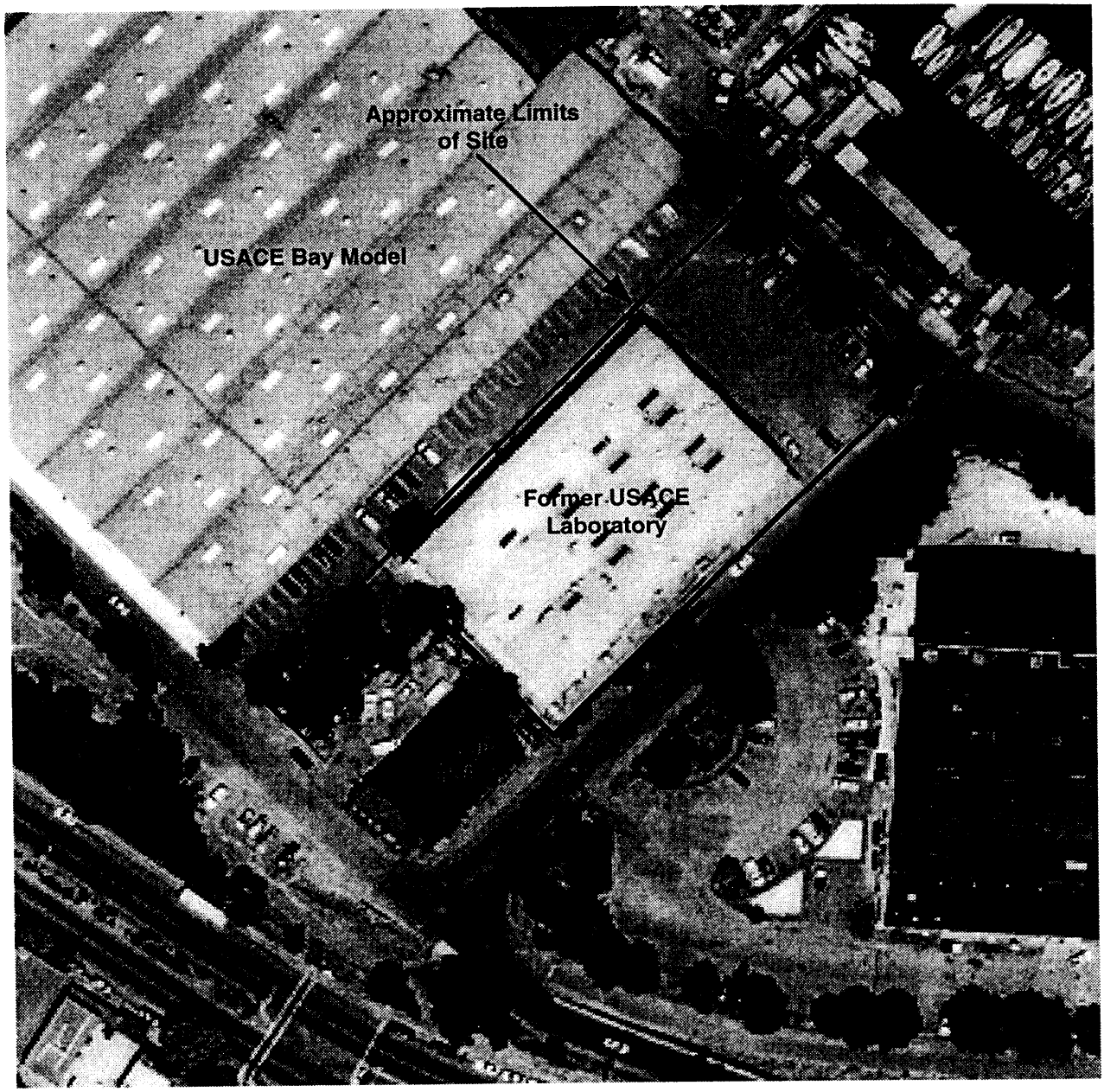
SITE LOCATION MAP

USACE South Pacific Division Laboratory
Sausalito, CA

US Army Corps of Engineers

INNOVATIVE TECHNICAL SOLUTIONS, INC.

11/F-2-SiteLayout



0 100 Feet 200 Feet

Approximate Scale

Source: Historical Aerial Photograph from August 14, 1995, Flight Number AV-4890-20-55, Pacific Aerial Surveys

FIGURE 2

SITE LAYOUT

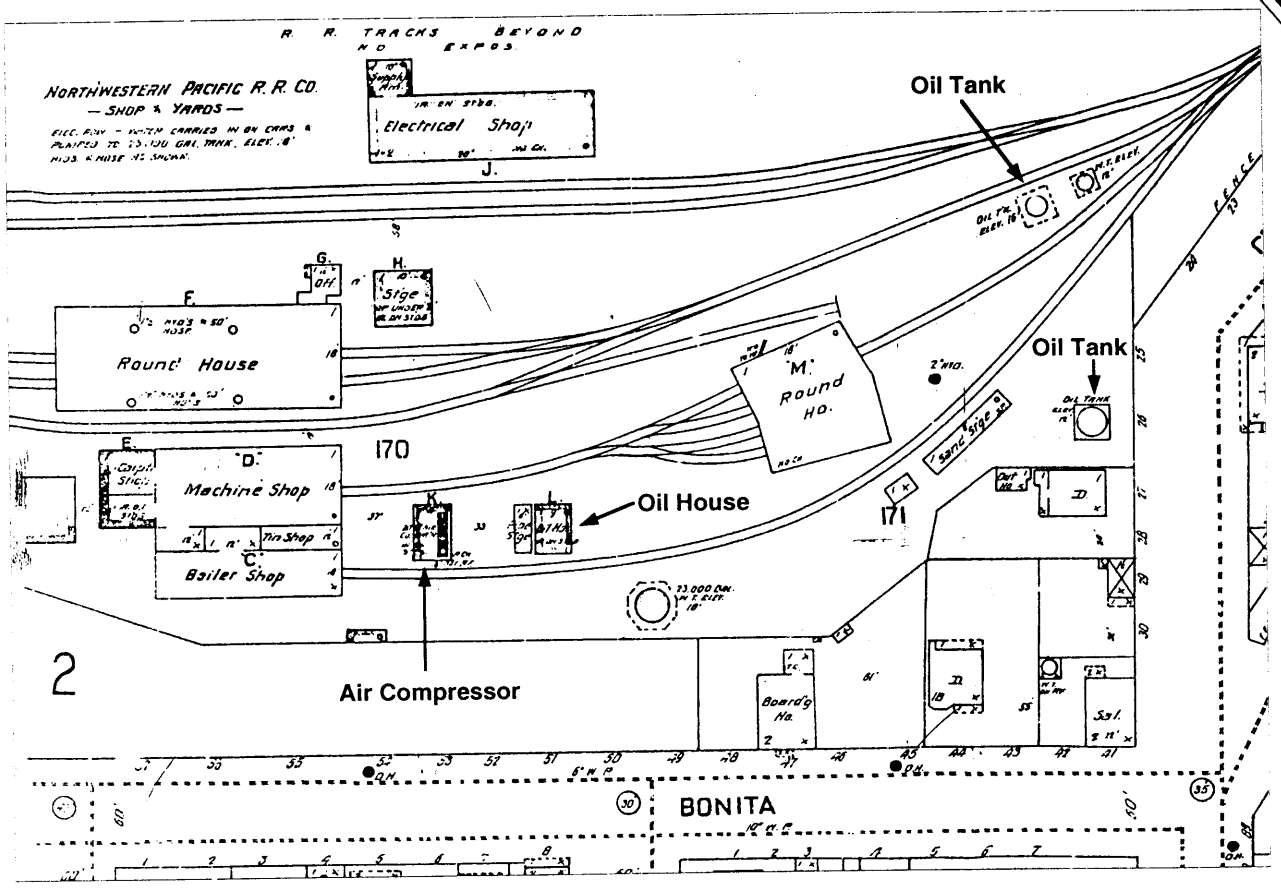
USACE South Pacific Division Laboratory
Sausalito, CA

US Army Corps of Engineers

ITSI

INNOVATIVE TECHNICAL SOLUTIONS, INC.

/F.3-1909Sanborn



0 100 Feet 200 Feet

Approximate Scale

Source: Sanborn Fire Insurance Map for 1909, EDR Sanborn, Inc.

FIGURE 3

1909 SANBORN FIRE INSURANCE MAP OF SITE AND SURROUNDING PROPERTY

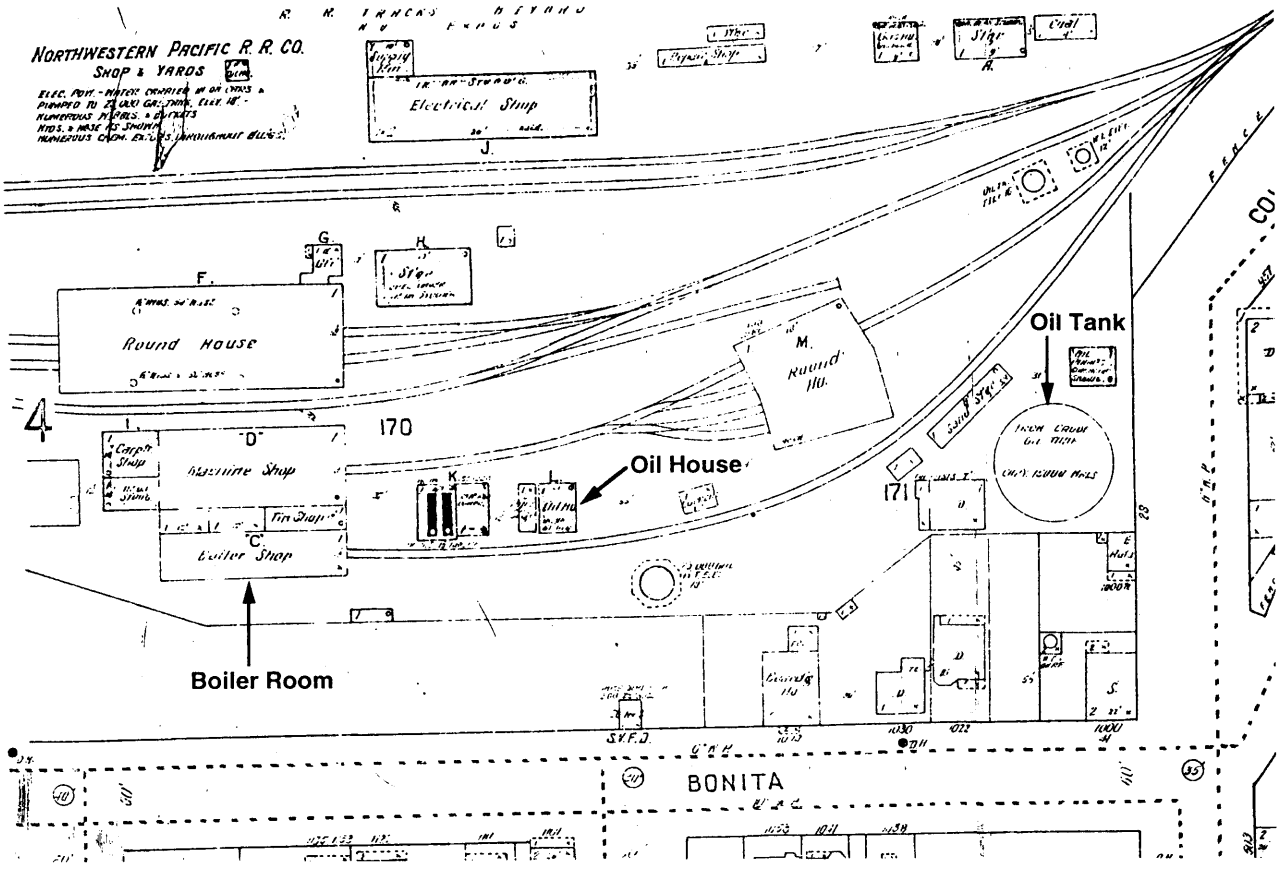
USACE South Pacific Division Laboratory
Sausalito, CA

US Army Corps of Engineers

ITSI

INNOVATIVE TECHNICAL SOLUTIONS, INC.

/F-4-1919Sanborn



0 100 Feet 200 Feet

Approximate Scale

Source: Sanborn Fire Insurance Map for 1919, EDR Sanborn, Inc.

FIGURE 4

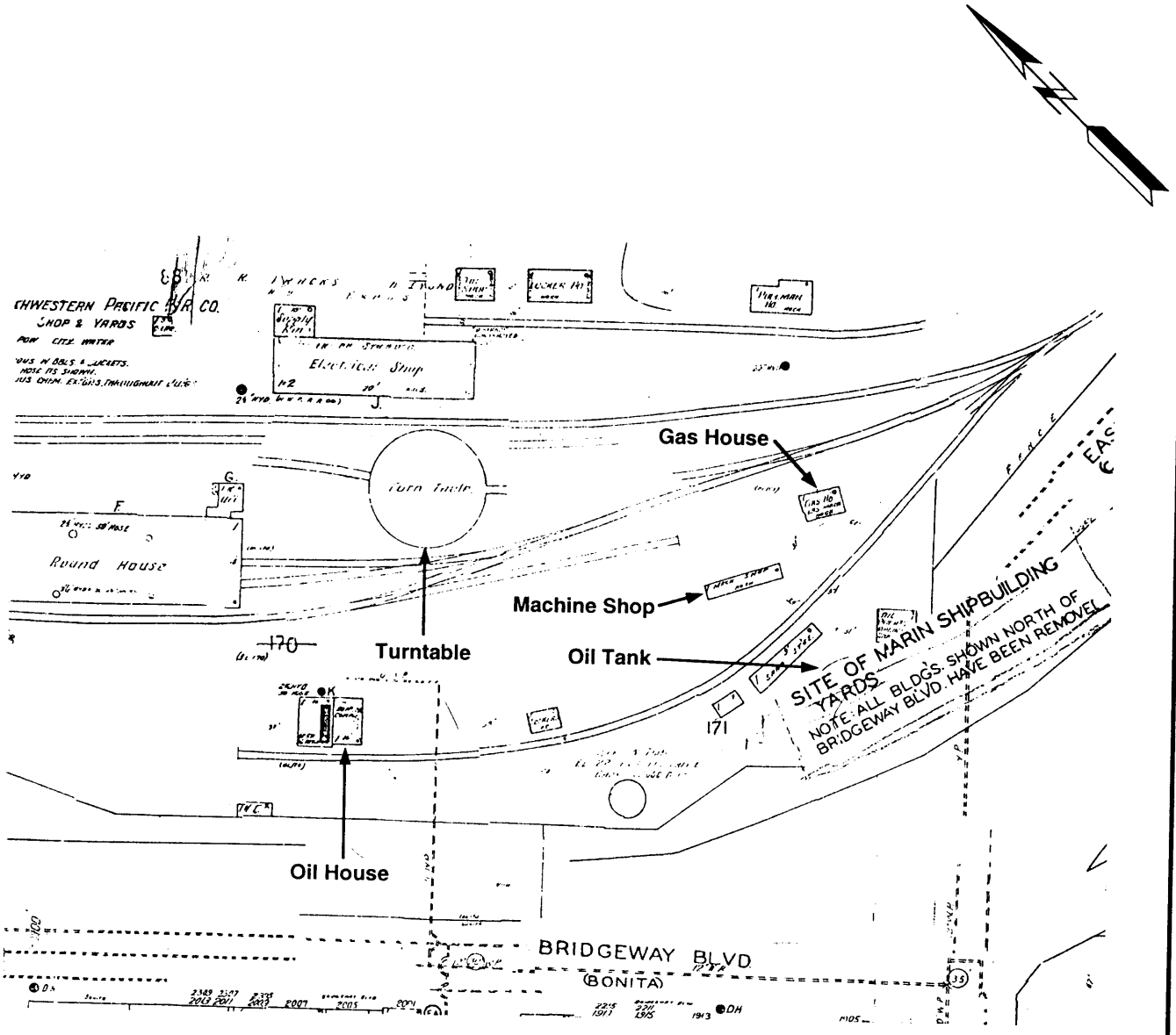
1919 SANBORN FIRE INSURANCE MAP OF SITE AND SURROUNDING PROPERTY

USACE South Pacific Division Laboratory
Sausalito, CA

US Army Corps of Engineers

ITSI

INNOVATIVE TECHNICAL SOLUTIONS, INC.



0 100 Feet 200 Feet

Approximate Scale

Source: Sanborn Fire Insurance Map for 1945, EDR Sanborn, Inc.

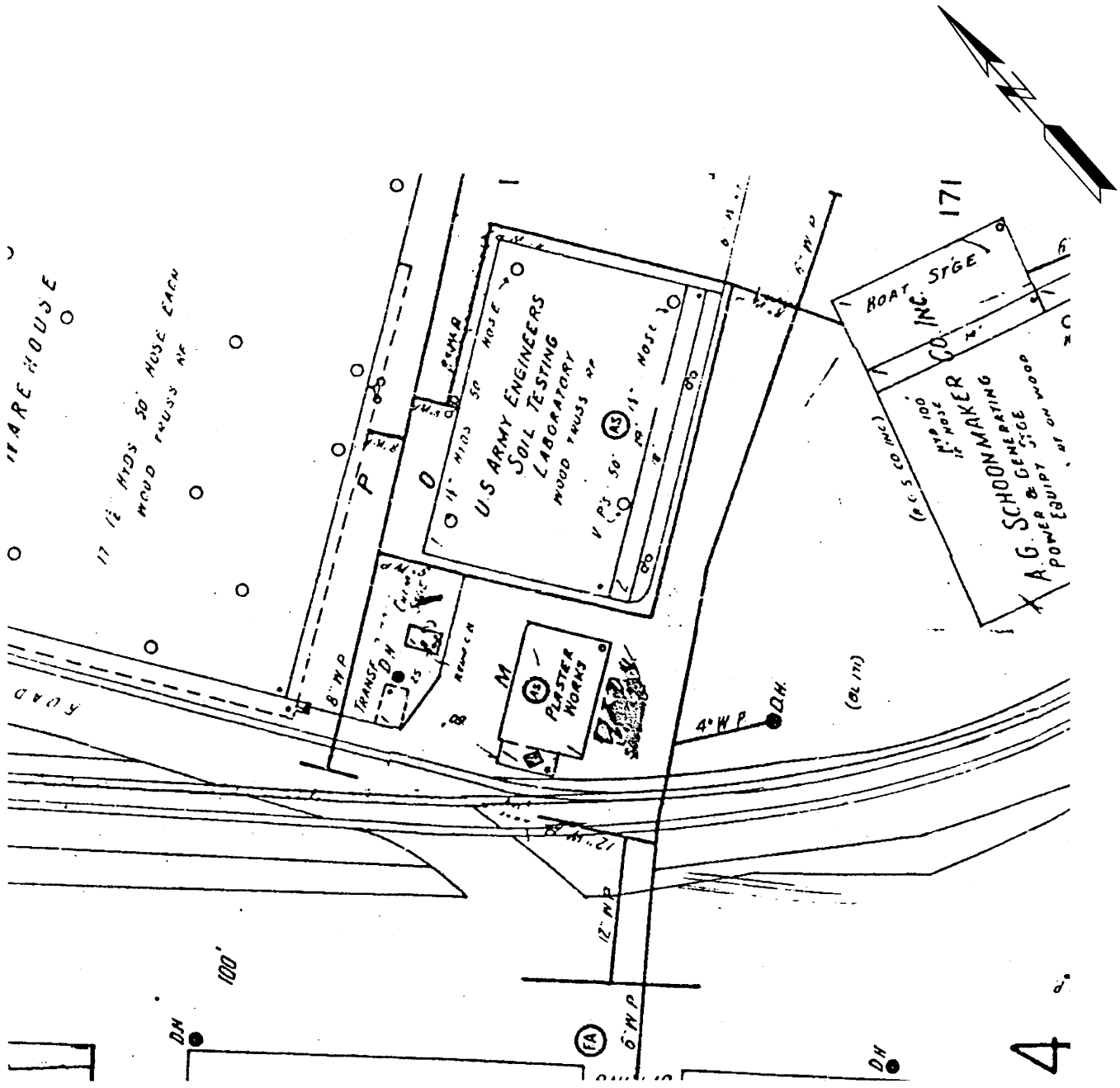
FIGURE 5

1945 SANBORN FIRE INSURANCE MAP OF SITE AND SURROUNDING PROPERTY

USACE South Pacific Division Laboratory
Sausalito, CA

US Army Corps of Engineers

ITSI
INNOVATIVE TECHNICAL SOLUTIONS, INC.



0 100 Feet 200 Feet

Approximate Scale

Source: Sanborn Fire Insurance Map for 1955, EDR Sanborn, Inc.

FIGURE 6

1955 SANBORN FIRE INSURANCE MAP OF SITE AND SURROUNDING PROPERTY

USACE South Pacific Division Laboratory
Sausalito, CA

US Army Corps of Engineers

INNOVATIVE TECHNICAL SOLUTIONS, INC.

Appendix E

Data Tables and Posting Maps from the VA Prelim Environmental Assessment

TABLE 1
Soil Sample Analytical Results - November 11, 2004
25 Liberty Ship Way, Sausalito, California

Sample	Depth	PCBs		Total Recoverable Petroleum Hydrocarbons (TRPH)
		Arochlors 1016, 1221, 1232, 1242, 1248, 1254, 1262, & 1268	Arochlor 1260	
	(feet)	(mg/kg)	(mg/kg)	(mg/kg)
A-1	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-2	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-3	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-4	0.5	<0.10	<0.10	630
	2	<0.10	<0.10	170
A-5	0.5	<0.10	0.91	3,300
	2	<0.10	13	150
A-6	0.5	<0.10	0.1	--
	2	<0.10	<0.10	--
A-7	0.5	<0.10	0.15	--
	2	<0.10	<0.10	--
A-8	0.5	<0.10	<0.10	18,000
	2	<0.10	<0.10	710
A-9	0.5	<0.10	<0.10	2,700
	2	<0.10	2.1	7,900
A-10	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-11	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-12	0.5	<0.10	0.29	11,000
	2	<0.10	<0.10	35
A-13	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-14	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-15	0.5	<0.10	0.24	6,100
	2	<0.10	<0.10	55
A-16	0.5	<0.10	<0.10	6,900
	2	<0.10	<0.10	<20
A-17	0.5	<0.10	<0.10	--
	2	<0.10	0.18	--
A-18	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--

TABLE 1
Soil Sample Analytical Results - November 11, 2004
25 Liberty Ship Way, Sausalito, California

Sample	Depth	PCBs		Total Recoverable Petroleum Hydrocarbons (TRPH)
		Arochlors 1016, 1221, 1232, 1242, 1248, 1254, 1262, & 1268	Arochlor 1260	
	(feet)	(mg/kg)	(mg/kg)	(mg/kg)
A-1	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-2	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-3	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-4	0.5	<0.10	<0.10	**630**
	2	<0.10	<0.10	170
A-5	0.5	<0.10	**0.91**	**3,300**
	2	<0.10	**13**	150
A-6	0.5	<0.10	0.1	--
	2	<0.10	<0.10	--
A-7	0.5	<0.10	**0.15**	--
	2	<0.10	<0.10	--
A-8	0.5	<0.10	<0.10	**18,000**
	2	<0.10	<0.10	**710**
A-9	0.5	<0.10	<0.10	**2,700**
	2	<0.10	**2.1**	**7,900**
A-10	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-11	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-12	0.5	<0.10	**0.29**	**11,000**
	2	<0.10	<0.10	35
A-13	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-14	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-15	0.5	<0.10	**0.24**	**6,100**
	2	<0.10	<0.10	55
A-16	0.5	<0.10	<0.10	**6,900**
	2	<0.10	<0.10	<20
A-17	0.5	<0.10	<0.10	--
	2	<0.10	0.18	--
A-18	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--

TABLE 1
Soil Sample Analytical Results - November 11, 2004
25 Liberty Ship Way, Sausalito, California

Sample	Depth	PCBs		Total Recoverable Petroleum Hydrocarbons (TRPH)
		Arochlors 1016, 1221, 1232, 1242, 1248, 1254, 1262, & 1268	Arochlor 1260	
	(feet)	(mg/kg)	(mg/kg)	(mg/kg)
A-19	0.5	<0.10	<0.10	**--**
	2	<0.10	<0.10	--
A-20	0.5	<0.10	**0.35**	160
	2	<0.10	**0.26**	210
A-21	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-22	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-23	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-24	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-25	0.5	<0.10	<0.10	280
	2	<0.10	<0.10	**520**
A-26	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-27	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-28	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-29	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-30	0.5	<0.10	<0.10	88
	2	<0.10	0.14	110
Criteria				
PRGs (industrial)		0.74 - 210	0.74	--
PRGs (residential)		0.22 - 6.3	0.22	--
ESLs - industrial and nonpotable GW		0.22	0.22	1,000
ESLs - residential and nonpotable GW		0.74	0.74	500

Note:

mg/kg : milligrams per kilogram

PCBs : Polychlorinated Biphenyls

BOLD : above residential screening criteria

BOLD : above industrial screening criteria

PRGs : Preliminary Remedial Goals (Department of Toxic Substances Control and EPA Region IX)

ESLs : Environmental Screening Levels (Regional Water Quality Control Board)

TABLE 1
Soil Sample Analytical Results - November 11, 2004
25 Liberty Ship Way, Sausalito, California

		PCBs		
Sample	Depth	Arochlors 1016, 1221, 1232, 1242, 1248, 1254, 1262, & 1268	Arochlor 1260	Total Recoverable Petroleum Hydrocarbons (TRPH)
	(feet)	(mg/kg)	(mg/kg)	(mg/kg)

Many sample revealed a high boiling point, non-PCB oil that was typically very darkly colored and in some cases black. The laboartory recommended method SM5520F to quantify Total Recoverable Petroleum Hydrocarbons.

TABLE 2

Grab Water Samples - Analytical Results - November 11/12, 2004

25 Liberty Ship Way, Sausalito, California

Boring	Depth	Volatile Organic Compounds				Polychlorinated Biphenyls (PCBs)
		Benzene	Toluene	Naphthalene	MTBE	
	(feet)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
A-1	15	<1.0	<1.0	<1.0	<1.0	<1.0
A-2	15	<1.0	<1.0	<1.0	<1.0	<1.0
A-3	15	<1.0	<1.0	<1.0	<1.0	<1.0
A-5	15	1.4	1.0	86	<1.0	<1.0
A-21	15	<1.0	<1.0	<1.0	<1.0	<1.0
A-25	15	<1.0	<1.0	<1.0	<1.0	<1.0
Criteria						
ESLs - nonpotable GW (odors)		20,000	400	210	1,800	160
ESLs - nonpotable GW (estuary)		46	130	24	8,000	0.014
ESL - Potable		1	40	17	5	0.014
CA MCL (primary)		1	150	--	13	0.5
USEPA MCL (primary)		5	1,000	--	--	0.5

Note:

µg/l : micrograms per liter

PCBs : Polychlorinated Biphenyls, Arochlors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262 &1268

ind : industrial

res : residential

BOLD : above residential screening criteria

BOLD : above industrial screening criteria

ESLs : Environmental Screening Levels (Regional Water Quality Control Board)

TABLE 1
Soil Sample Analytical Results - November 11, 2004
25 Liberty Ship Way, Sausalito, California

Sample	Depth	PCBs		Total Recoverable Petroleum Hydrocarbons (TRPH)
		Arochlors 1016, 1221, 1232, 1242, 1248, 1254, 1262, & 1268	Arochlor 1260	
	(feet)	(mg/kg)	(mg/kg)	(mg/kg)
A-19	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-20	0.5	<0.10	0.35	160
	2	<0.10	0.26	210
A-21	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-22	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-23	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-24	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-25	0.5	<0.10	<0.10	280
	2	<0.10	<0.10	520
A-26	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-27	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-28	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-29	0.5	<0.10	<0.10	--
	2	<0.10	<0.10	--
A-30	0.5	<0.10	<0.10	88
	2	<0.10	0.14	110
Criteria				
PRGs (industrial)		0.74 - 210	0.74	--
PRGs (residential)		0.22 - 6.3	0.22	--
ESLs - industrial and nonpotable GW		0.22	0.22	1,000
ESLs - residential and nonpotable GW		0.74	0.74	500

Note:

mg/kg : milligrams per kilogram

PCBs : Polychlorinated Biphenyls

BOLD : above residential screening criteria

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PRGs : Preliminary Remedial Goals (Department of Toxic Substances Control and EPA Region IX)

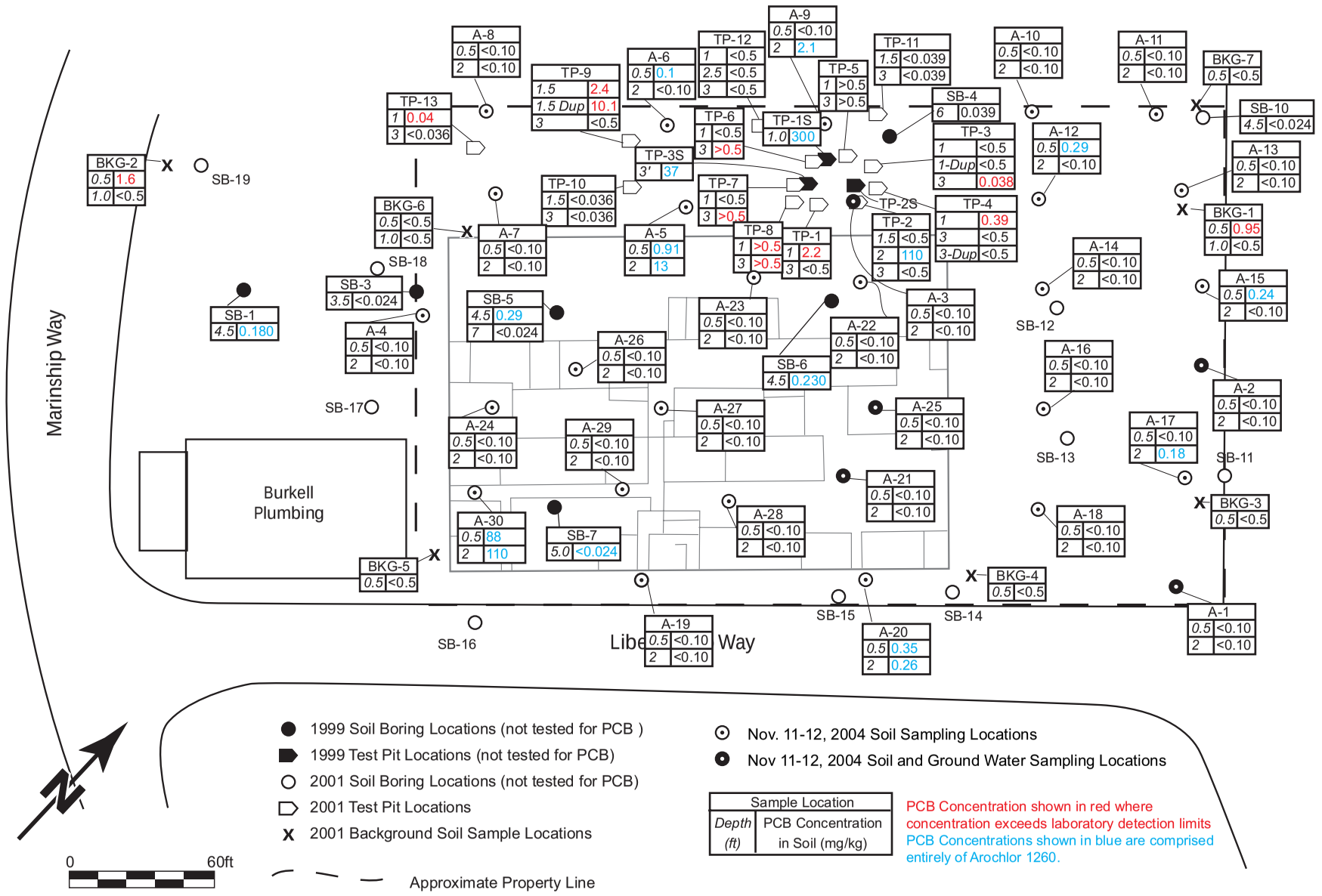
ESLs : Environmental Screening Levels (Regional Water Quality Control Board)

Many sample revealed a high boiling point, non-PCB oil that was typically very darkly colored and in some cases black. The laboartory recommended method SM5520F to quantify Total Recoverable Petroleum Hydrocarbons.

N

0 2000ft

ERG Environmental Resource Group	**Former USACE Soils Lab** **25 Liberty Ship Way, Sausalito, California**	**Plate 1.** Site Location



ERG
Environmental Resource Group

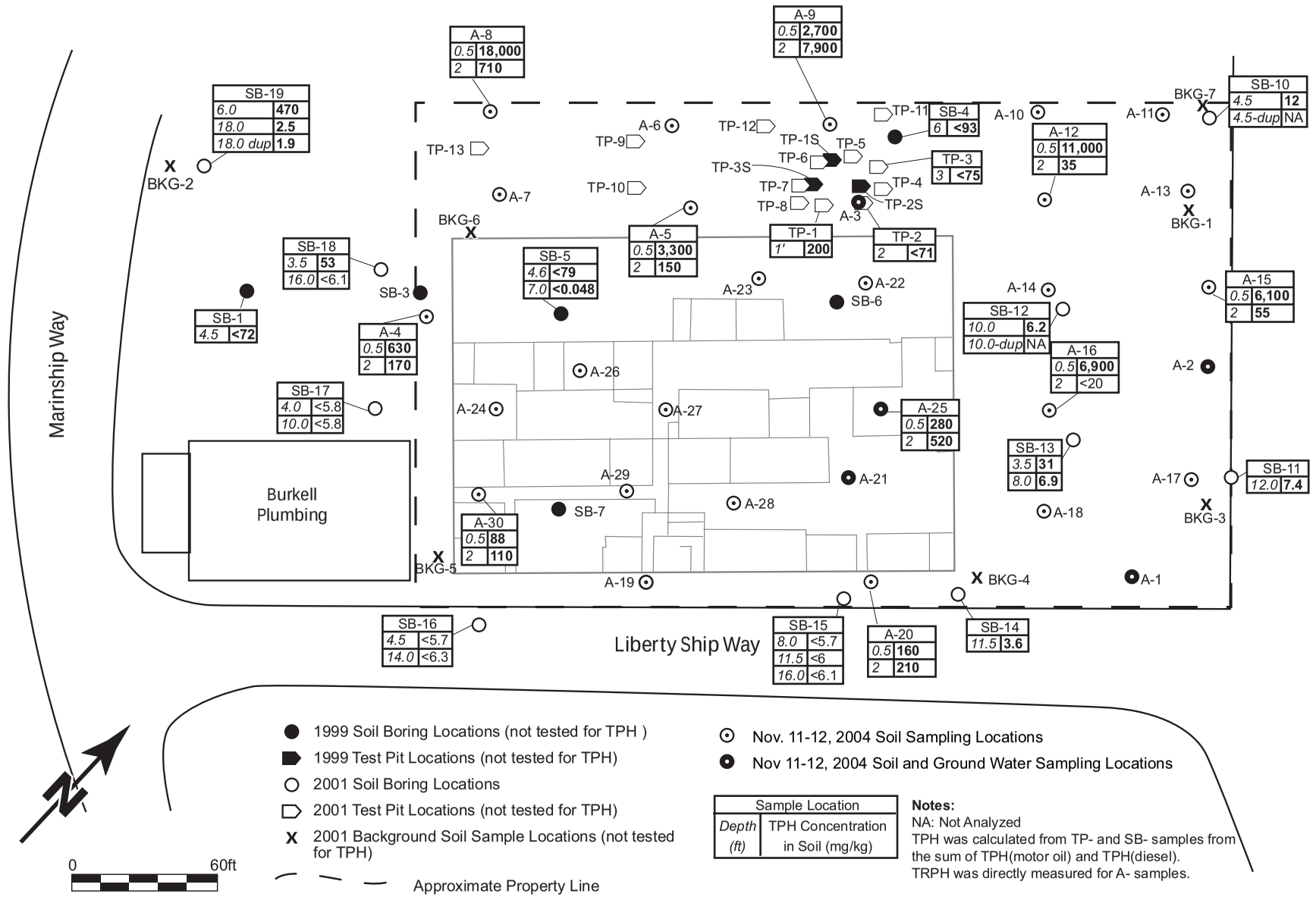
Former USACE Soils Lab

25 Liberty Ship Way, Sausalito, California

Site plan adapted from Innovative Technical Solutions, Inc. 2001

Plate 2.

PCB Concentration in Soil



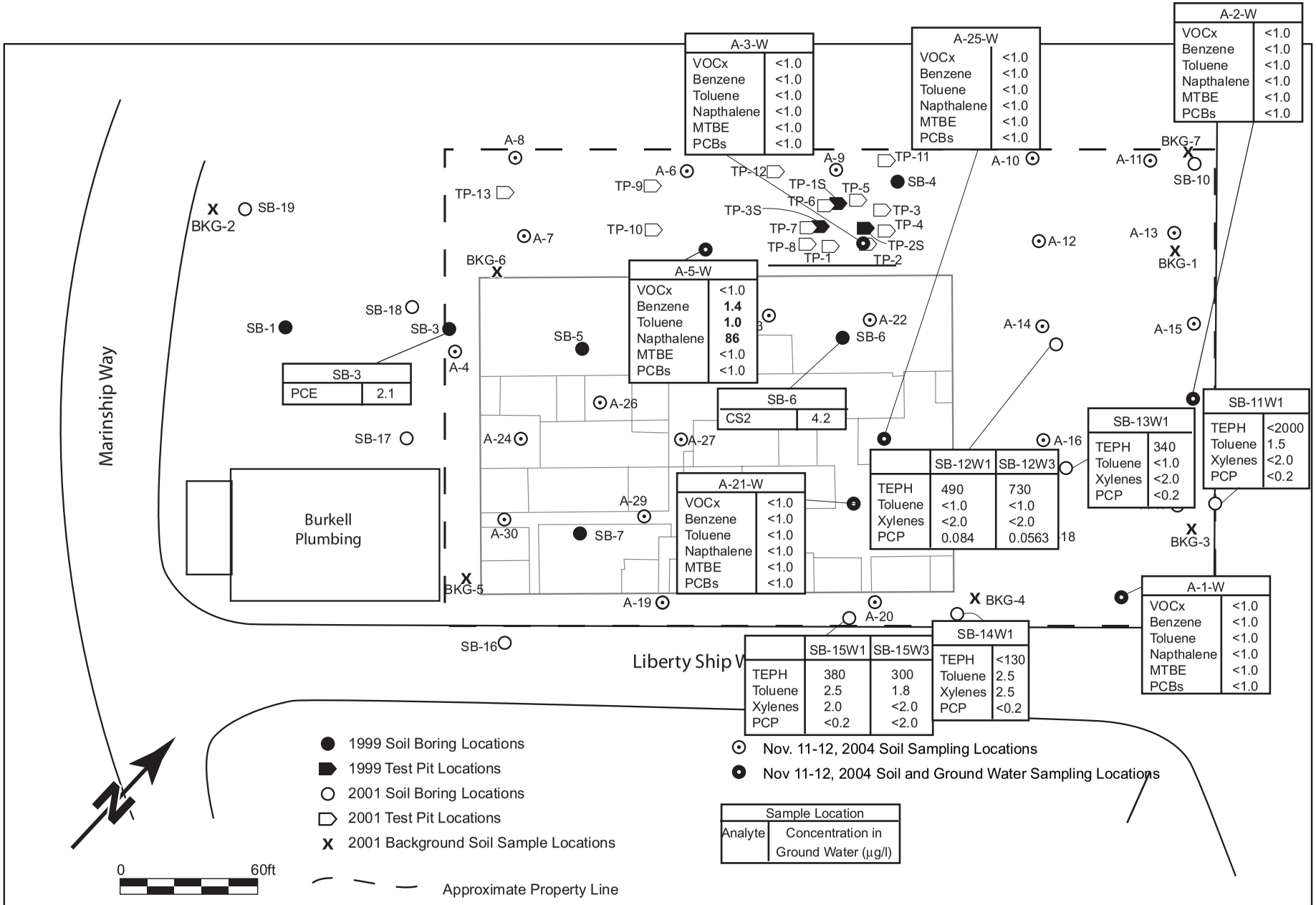
Notes:
NA: Not Analyzed
TPH was calculated from TP- and SB- samples from the sum of TPH(motor oil) and TPH(diesel).
TRPH was directly measured for A- samples.

ERG
Environmental Resource Group

Former USACE Soils Lab
25 Liberty Ship Way, Sausalito, California

Site plan adapted from Innovative Technical Solutions, Inc. 2001

Plate 3.
Total Petroleum Hydrocarbon Concentration in Soil



ERG
Environmental Resource Group

Former USACE Soils Lab

25 Liberty Ship Way, Sausalito, California

Site plan adapted from Innovative Technical Solutions, Inc. 2001

Plate 4.

Ground Water Analytical Results

Appendix F

Memorandum regarding proximity of drinking water wells

17 March 2005

Memorandum for File

To: Brad Call, Paul Feldman

Subject: Drinking Water Wells in the Vicinity of SPD Laboratory, Sausalito, California.

Executive Summary: There are no drinking water wells in the City of Sausalito. There are no known drinking water wells within three miles of the SPD Laboratory.

The following list contains the organizations and points of contact that used. The POCs that are underlined were particularly helpful and informative.

Regional Water Quality Control Board, Oakland, CA.
Will Brooms (510) 622-2300

Sausalito Department of Public Works
Ken Basso (415) 289-4113

Marin County Municipal Water District
Mike Beaver (415) 945-1455
Ona Konkling (415) 945-1532
Ken Feil

City Engineers Office
Paul Klassen (415) 289-4111 / (707) 571-8005
Dario Celevante (415) 289-4110
Leonard Michaels (415) 289-4192

Marin County Health Department
Steve Callow (415) 499-6907 / (415)

All municipal drinking water is supplied through the Marin County Municipal Water District. 75% of the drinking water supply is taken from reservoirs on Mount Tamalpias and 25% is imported from the Russian River. There are no municipal drinking water supply wells within the City of Sausalito.

Private drinking water wells are permitted through the Marin County Health Department. No permits are on file for currently active drinking water wells within a three-mile radius of the SPD Laboratory.

In the past, water from active springs in the area had been used as a drinking water supply until a more dependable supply could be located. Once a more consistent source was located and/or constructed, the water from the springs was used solely for agricultural purposes. There is no information that the springs are currently used for any purpose.

BJ Bailey
Geologist

Appendix G

Response to Comments

Comment response table for; Draft Final Removal Action Work Plan, South Pacific Division Laboratory, Sausalito, California, dated April 2005, by the US Army Corps of Engineers

Comments provided by Charles Ridenour, DTSC on May 19, 2005:

Number	Comment	Response
1	California law requires that for any hazardous substance release site that is not cleaned up to unrestricted, i.e. residential use standards, DTSC cannot approve the removal action work plan or certify final cleanup unless land use restrictions are implemented as part of the remedy. The regulations allow for alternative documentation or agreement equivalent to a Land Use Covenant if the property is owned by the federal government and does not have a county parcel number. Therefore, if the Army intends to clean up to industrial standards, DTSC requires the selected remedy include institutional controls to prevent future residential land use. We would also like to discuss the options for documenting these controls in the transfer documents and ensuring their long-term effectiveness.	As discussed on June 10, 2005, the RAWP will be changed to include a section explaining the land use restrictions. If the expected transfer to the Veteran's Administration occurs then the RAWP, the removal action report, and the environmental condition of property report, will document the land use restrictions. Should the federal-to-federal transfer not occur, and title transfer take place, then appropriate deed restrictions will be prepared in addition to land use restrictions discussed in the documents listed above.
2	The RAWP will need a public notice of availability and invitation for comment in a newspaper of general circulation in the area of the project and include a 30-day public comment period.	The RAWP will be changed to note a 30-day public comment period that will begin after we receive regulatory acceptance. The notice will be placed in the Marin Independent Journal and will include the following text: "The Department of Toxic Substances Control has prepared a Draft CEQA Notice of Exemption for this project, any question concerning the exemption should be addressed to Charles Ridenour, DTSC's project manager at (916) 255-3571."
3	Add the street address for the property	The RAWP will be changed to note the property address, which is 25 Liberty Ship Way.

Comments provided by Laurent Meillier, San Francisco Bay Regional Water Quality Control Board, on June 9, 2005:

Number	Comment	Response
1	The USACE needs to include an approval signature page in this report to be signed by agencies (USACE, DTSC, and Water Board) managers.	The RAWP will be changed to include an approval page including the Corps of Engineers, DTSC, and the Regional Board. Separate copies of this page will be distributed to speed the concurrence process. The USACE requests that the Regional Board and DTSC provide the name, title, address and phone number of the individual who will sign the approval page on behalf of their agency.
2	The USACE mentions that the U.S. Veterans Administration has "conducted a Phase I Environmental Site Assessment in preparation for property transfer." Please provide additional information regarding this transfer to include: timeline, landuse changes and a map of the parcels to be included.	This information will be provided under separate cover.
3	Per California Law a deed restriction will be required where cleanup does not reach a level of unrestricted residential reuse. To avoid this requirement the site needs to be cleaned up to meet residential landuse criteria.	Please see the response to DTSC comment #1.
4a	Water Board is concerned by the following statement made in the executive summary: "no contingency to remove additional soil based on post-excavation sampling." The USACE needs to further clarify this statement. Please outline a removal action strategy that might be necessary in the event that the confirmation samples outlines an area exceeding the cleanup criteria.	The RAWP will be changed to indicate that the USACE will attempt to remove all contamination that exceeds the criteria, given the restrictions of access and funding.
4b	Furthermore, Water Board staff does not agree with the statement: "The removal action is not intended to remove all of the PCB contamination known to be present at the site." Instead, please state that all soils exceeding the cleanup criteria will be removed at the site.	Please see the response to Regional Board comment #4a.

Number	Comment	Response
4c	Furthermore, please compare the contaminants concentrations detected in soils and groundwater against regionally specific ambient values.	The RAWP will be changed to compare maximum detected concentrations against Regional Board Environmental Screening Levels. The Regional Board provided reference to sediment concentrations (SFEI data) and these are as follows: the range of arsenic in Richardson Bay sediment is 5.4 to 12.8 mg/kg. The range of lead in Richardson Bay sediment is 13.3 to 45.6 mg/kg. In addition the USACE reviewed the Bradford, et al, study regarding California background soil concentrations and the values are: arsenic ranges from 0.59 to 11.0 mg/kg and lead ranges from 12.4 to 97.1 mg/kg. The Regional Board has also provided information on three nearby sites, unfortunately little data was available that relates to the background metal question. This information will be added to the RAWP.
4d	Finally, the USACE will need to address impacts to groundwater quality where contamination exceeds applicable criteria.	As discussed on August 15, 2005, the USACE recommends that no groundwater remediation be conducted as a part of this RAWP. This recommendation is based on the current and future land use (industrial/commercial), the knowledge that the groundwater is not potable, the likelihood that the area will remain paved, the knowledge that the contaminants at the site have low mobility, and that no clear source was identified during the investigations. In our professional judgment there would be little benefit to groundwater treatment.
5	Please include hydrocarbons, metals, PAHs (Polycyclic Aromatic Hydrocarbon), chlorinated hydrocarbons within the proposed removal action if they exceed the cleanup criteria.	The USACE recommends that the focus of the interim removal action, and the associated confirmation sampling, remain on the PCB hot spots as identified in the RAWP. The USACE jointly developed this approach with DTSC during an earlier phase of the project and this remains our preferred option. The PCBs clearly represent the largest

Number	Comment	Response
		mass of contamination at the site as well as being the largest health risk to those using the site in the future.
6	The USACE needs to improve their site-specific risk analysis with identifying the anticipated exposure pathways and receptors before and after excavation work.	The RAWP will be changed to better emphasize that the exposure pathway will be incomplete due to the paving and that groundwater will not be used at the site.
7	Please add Health and Safety, ARAR (Applicable Relevant Appropriate Requirement) sections within the report. Please note that we consider the 1995 San Francisco Bay Basin Plan as an ARAR. The surface and groundwater beneficial uses need to be listed as per this regulatory document.	The San Francisco Bay Basin Plan, and beneficial uses for surface and groundwater, has been mentioned in the ARAR section of the RAWP.
8	Provide a brief summary of the geology and hydrogeological (including groundwater potability per SWRCB resolution 88-63) conditions at the site. Include a detailed site wide base map showing isoconcentrations contours of the contaminants of concern in both soils and groundwater at the surface and at depth.	The RAWP will be changed to better highlight the specific conductance (SC) and TDS data that suggests the water is not potable. The data is as follows: • SB13, TDS – 5,800 mg/l, SC – 11,000 umho/cm (7,040 mg/l TDS equivalent) • SB11, SC – 6,300 umho/cm (4,032 mg/l TDS equivalent) • SB12, SC – 10,000 umho/cm (6,400 mg/l TDS equivalent) • SB14, SC – 6,500 umho/cm (4,160 mg/l TDS equivalent) • SB15, SC – 1,000 umho/cm (640 mg/l TDS equivalent) As shown by the site data the water is not potable as defined by State Resolution 88-63. Unfortunately the sporadic nature of the contamination does not allow for creation of isoconcentration contour figures.
9. Section 2.1, pg 7	Determine if there is a drinking water well within one mile from the site under investigation. Provide the distance to the closest water body.	The RAWP will be changed to indicate that there are no drinking water wells within one mile of the site and to indicate that Richardson Bay is adjacent to the site.

Number	Comment	Response
10. Section 2.3.3, pg 8	Indicate and map the contaminants concentrations found in soils and groundwater at the site. Compare these areas of concern to the proposed excavation locations.	Figures showing the contaminant locations will be added to the RAWP.
11. Section 2.3.3, pg 8	Explain the basis for stating that the "The metals detected in the groundwater are not thought to represent contamination."	As stated in earlier reports, the metals contamination in the groundwater is not thought to represent a release from the SPD lab, but reflect the earlier history of imported dredge sediments for fill and prior industrial activity.
12. Section 4.3.3, pg 13	Indicate how it was determined that no "ecological receptors are currently exposed to PCB."	This statement was based on the low mobility of PCBs in soil, the fact that the site is paved, and the fact that they had not been detected in the groundwater.
13. Section 4.3.3, pg 13	Indicate in a table the cost associated with each of the remedial alternatives analyzed.	As discussed on June 10, 2005, no discussion of costs will be added to the RAWP.
14. Section 6.2.1, pg 15	Provide the basis for the pre-determined dimensions of the proposed excavation areas. The volume and extent of the excavated areas should be based on meeting the cleanup criteria.	The extent of the excavation shown in the RAWP makes use of all existing chemical data to identify the soil most likely to contain concentrations that exceed the clean-up criteria.
15. Section 6.2.4, pg 16	State how the contaminated soils will be isolated and stored prior to appropriate disposal off site.	As presented in Section 5.2.1 of the RAWP, the excavated soil will be placed in watertight roll-off bins for storage until disposal.
16. Appendix A	Paginate all pages found in the appendix.	Page numbers will be added to the appendix.
17. Appendix A	Please refine this section to include confirmations sampling procedures (depth, frequency, locations) for soils following the excavation effort. Please sample the suite of contaminants of concern.	The first page of Appendix A will be changed to better describe the confirmation sampling procedures. As discussed in the response to Regional Board comment #5, the USACE recommends that the confirmation sampling remain focused on the PCBs.